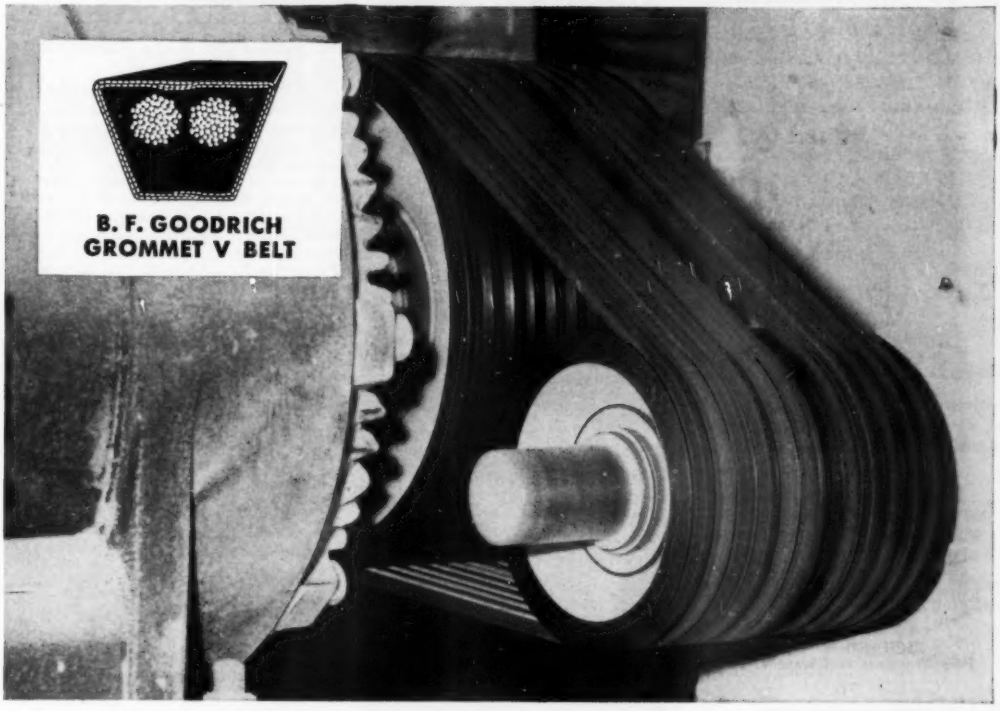
RESEARCH KEEPS **B.F.Goodrich** FIRST IN RUBBER



Where B.F.Goodrich grommet belts outlasted others 3 to 1

B.F.Goodrich grommet V belts cut costs 20 to 50%

ORDINARY belts, previously used on this drive, couldn't stand the heavy load, couldn't take the strain of 24-hour-a-day service. There were frequent shutdowns for repairs. Belts were averaging only 3 months' life. Then B.F.Goodrich grommet V belts were installed. When the picture was taken, the grommet belts had already outlasted ordinary belts 3 to 1, maintenance costs had been cut nearly 100%, and the belts still looked good for a lot more service. Here's why:

No cord ends — A grommet is endless, made by winding heavy cord on itself to form an endless loop. It has no overlapping ends. Because most of the failures in ordinary V belts occur in the region where cords overlap, the endless cord section in a grommet V belt eliminates such failures.

Concentrated cord strength — All of the cord material in a B.F.Goodrich grommet belt is *concentrated* in twin grommets, positioned close to the driving faces of the pulley. There are no layers of cords to rub against one another and generate heat; cord and adhesion failures are reduced. And grommet V belts stretch less — only ⅓ as much, on an average, as ordinary V belts.

Better grip, less slip — Grommet V belts have more rubber in relation to belt size. Without any stiff overlap, they're more flexible, grip pulleys better. Size for size, grommet belts give ⅓ more gripping power, pull heavier loads with a higher safety factor. Because there is less slip, there is also less surface wear.

They cost no more — Grommet V belts cut costs because they last longer, increase production because machines keep running with fewer interruptions, reduce maintenance costs because they need less attention, yet they cost not one cent more. Available in C, D, and E sections. But remember, only B.F.Goodrich makes the grommet V belt (U. S. Patent No. 2,233,294), so to get all these savings, call in your local BFG distributor the next time you need V belts, or write *The B.F.Goodrich Company, Industrial & General Products Div., Akron, Ohio.* (Available in Canada)

Grommet V-Belts BY
B.F.Goodrich
FIRST IN RUBBER

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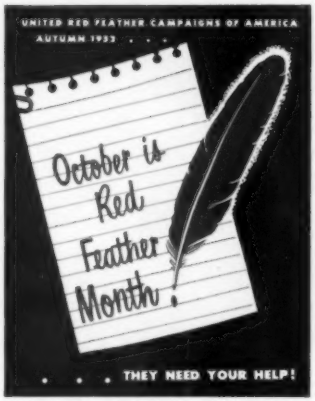
'ROUND ABOUT with the editors in field and office

Edited by R. L. Marinello

Make a Note of This

THE PLANT MAINTENANCE SHOW for 1953 is scheduled for the Public Auditorium in Cleveland. The dates are January 19 to 22, inclusive. The Plant Maintenance Conference will be held in conjunction with the show. Mark this down in your book of coming events.

Advance registration cards may be obtained from Clapp & Poliak, Inc., 341 Madison Ave., New York.



Helpful Leaflets Are Available

The following leaflets were prepared by Small Defense Plants Administration's Management Service Division, and are intended to assist small firms:

1. SHARPENING OF DRILLS, LATHE TOOLS AND MILLING CUTTERS, gives detailed technical information on the sharpening of these tools to exact tolerances, and the proper type of grinding equipment that should be used.

2. PROPER ALIGNMENT OF MACHINE TOOLS, outlines standard techniques developed by machine tool manufacturers for aligning various machine tools to meet exacting production requirements.

3. ADEQUATE PRODUCTION CONTROL, is designed to give the small businessman the information he needs to cope successfully with this problem.

4. HOW SMALL PLANTS CAN SELL TO THE FEDERAL GOVERNMENT, was prepared to help the small manufacturer sell his products to the Government.

Small plants desiring any of these leaflets may obtain them by notifying one of the nearest field offices located in Boston, New York, Philadelphia, Richmond, Atlanta, Cleveland, Detroit, Chicago, Minneapolis, Kansas City, Dallas, Denver, San Francisco, Los Angeles, and Seattle.

Small manufacturing firms desiring to obtain all of the leaflets in this series as they are issued should request that their name be added to the mailing list now being compiled. Requests may be made to either the nearest SDPA field office or to the Washington office, 1337 E Street, N.W., Washington, D. C.

Plant Engineer Is Promoted

Naysmith

Archie M. Naysmith, formerly plant engineer, has been appointed to the new position of general superintendent and plant engineer at Macwhyte Co., Kenosha, Wisconsin.

He has a background of 36 yr experience. He came to Macwhyte Co. 24 yr ago from Scotland, where he had 12 yr of experience in production, laboratory, machine shop, and plant engineering at Bruntons Ltd., Musselburgh, Scotland.

To help Mr. Naysmith with the many plant engineering duties about the plant, **R. B. Whyte, Jr.,** was appointed assistant general superintendent and plant engineer.

News of Plant Engineers Clubs

Chicago: The Plant Engineers Society of Chicago held their first meeting of the 1952-1953 season, Thursday, September 4th. Twenty members were on hand to start off the new year.

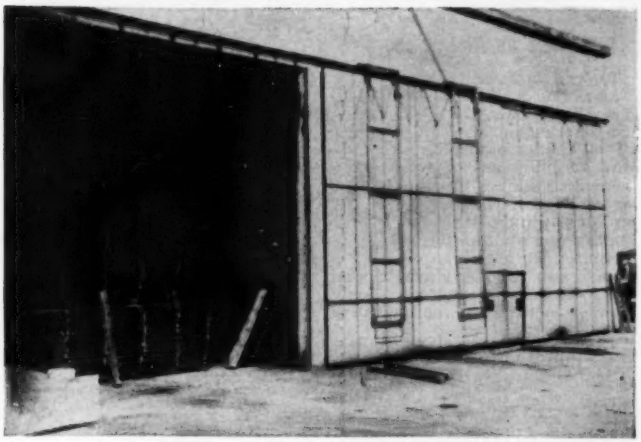
This meeting consisted of a round-table discussion on the subject "Contractor vs. Plant Maintenance Crews." Each member was allowed several minutes to discuss how his company handled such services as painting, and electrical, roof, floor and building repairs. The discussion proved very interesting and the Club

(Continued on page 6)

Plant Engineering is published monthly at Chicago, Ill. Subscriptions one year $10 in the U. S. A. Canada $11; Elsewhere $12. Acceptance under Section 34.64, P. L. & R. authorized by Post Office.

"Best" New Dry Kilns Work Better with Armstrong Unit Trapping

4 Traps Increase Capacity 8%



▲ One Armstrong No. 215 inverted bucket steam trap is used on each of the four dry kiln coils at Wells-Oates Lumber Co., New Bern, N. C.

◀ The time cycle on this lumber dry kiln was reduced from 72 to 66 hours by Armstrong Unit Trapping.

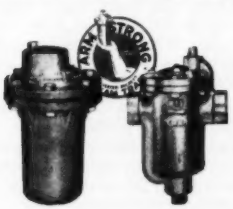
OFTEN a large capital investment in steam heated equipment is not utilized fully simply through failure to drain condensate and air efficiently. Here is a typical case:

Wells-Oates Lumber Co., New Bern, N. C., recently made one of the finest and most modern dry kiln installations possible. And it worked fine. But, it works better now, thanks to the installation of an individual Armstrong steam trap on each of the four steam coils in the kiln. The kiln cycle time has been reduced from 72 hours to 66 hours. The capacity has thereby been increased over 8% by an investment in traps of only a little over $200.

The trap installation was made upon the recommendation of DeWitt H. Skinner of Allan T. Shepherd Co., the local Armstrong Representative. The reason behind his recommendation made sense to the Wells-Oates people —*"with one trap on each of the four coils of the kiln, all coils would be properly purged of condensate and air and it would, therefore be impossible for one coil to influence the operation of another coil." The results proved the point.*

Your local Armstrong Representative may be able to show you how to get more out of your steam heated equipment. Remember, he sells a product that is *guaranted to satisfy. Call him or write:*

You always get more out of equipment when you use Armstrong "Unit Trapping"



ARMSTRONG MACHINE WORKS

912 Maple Street, • Three Rivers, Michigan

See Our Exhibit National Power Show
Grand Central Palace, New York, December 1-6

SEND FOR 44-PAGE STEAM TRAP BOOK

a Catalog and Educational Handbook on Condensate Drainage

Attach to your Company Letterhead and Mail Today.

ARMSTRONG MACHINE WORKS
912 Maple Street, Three Rivers, Michigan

Please send me a Steam Trap Book.

Name .....

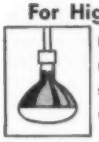
Title .....

New Floodlamps Solve Tough Problems Indoors and Outdoors

MAXIMUM LIGHT OUTPUT • WIDE BEAM

200 to 1000 Watts
St'd. or High Voltage

For High or Low Bays



High light output maintained throughout lamp life. Only simple socket required. No reflectors to clean.

For Wet or Dusty Locations

Hard glass withstands moisture and sudden temperature changes. Inside silver reflector not affected by dirt and corrosive fumes.

For Outdoor Lighting

Permits use of low-cost weatherproof housing, reducing cost, size, and weight of installation. Easy to maintain.

Send for Technical Bulletin 80

RADIANT HI-FLOOD

Reflector Weatherproof

FLOODLAMPS

RADIANT LAMP CORPORATION
300 Jelliff Avenue Newark 8, N. J.

Manufacturers of Lamps for
PROJECTION • FLOODLIGHT • SPOTLIGHT • MOTION PICTURE PRODUCTION
AERONAUTICAL • SPORTS LIGHTING AND GENERAL SERVICE • RECTIFIER BULBS

News of Plant Engineers Clubs

(Continued from page 4)

is planning to have several more.

For the October meeting, the Club plans to visit Continental Can Co., at 5401 W. 65th St., Chicago. This will be on October 8th and the tour of the plant will begin at 11:30. Those interested in making this tour should contact **Homer B. Zoeter,** plant engineer, Continental Can Co., 5401 W. 65th St., Chicago, Ill.

There will be a joint meeting of The Plant Engineers Society of Chicago and the Plant Engineers of the Calumet Region, on November 25th.

Editor Takes on Another Job

Andrew Kramer, Editor, *Power Engineering*, companion publication of PLANT ENGINEERING, was recently appointed to the Advisory Committee on Technological Information of the Atomic Energy Commission. Of the 19 members on this Advisory Committee, Andy Kramer is the only representative of the power industry.

This committee was originally set up in 1949 to assist the Commission and staff in making available to American industry unclassified and declassified technological information developed in the nation's atomic energy facilities. The Committee's findings and recommendations have aided the Commission greatly and now is being made a permanent Advisory Committee on Technological Information.

The Committee will survey and evaluate, from the viewpoint of industry, specific fields of AEC-developed technology and will suggest how best to disseminate AEC information of use to industry.

How Slippery Is "Slippery" Gas?

WHILE THERE IS some good information in the article, "Handling 'Slippery' Gases with Compressors," by Charles Stempf in the July issue of PLANT ENGINEERING, I think there is a portion of it which should not be accepted without reservations. I refer specifically to the following:

Although hydrogen does not comply with all the gas laws, it is actually one of the best gases to handle. Calling it "slippery" is a misnomer. Any of the difficulties attributed to it are usually caused by poor compressor design.

Much space is devoted to gas leakage which makes it appear that this is an influencing factor in compressor design. This is "putting the cart before the horse." Fig 2 shows a four stage compressor which presumably may be intended for pressures up to 6,000 psi but, for this range of pressures, the application of a gas tight packing for any piston rod should be easy. *Walter Coopey, Engineering Consultant.*

Author's Reply

"Slippery" may mean many things. As used in the article, it referred to that quality of a gas which makes it more likely to escape past piston rings, along rods, through packings, gaskets, valves, and the like. Such characteristics must be taken into account when designing compression equipment and predicting the performance thereof.

The question of packing relates to the particular application involved and the nature of the gas being handled. Whereas a simple packing will serve admirably in many cases, additional precautions such as double seal housings are very desirable in other cases. Careful study and consideration of all factors involved is advisable in all cases. *Charles Stempf, Worthington Corp.*

'ROUND ABOUT

National Safety Congress

THE NATIONAL Safety Council will celebrate its 40th anniversary when the 40th annual National Safety Congress is held in Chicago, from October 20 to 24.

This Congress will be dedicated to celebrating and commemorating four decades of safety. Efforts are being made to have as many as possible of the safety pioneers who attended the first Congress in 1912 attend the 40th Congress as honor guests of the National Safety Council.

Further information on the many sessions of the Congress may be obtained by contacting Paul Jones, Director of Public Information, National Safety Council, 425 North Michigan Ave., Chicago 11, Illinois.

Plant Engineers Talk Back

Plant Engineering wishes to call your attention to the new department "Back Talk About Past Issues" which begins on page 18 in this issue. Your comments, constructive or otherwise, are always welcome.

Maybe you have a problem at the plant. Write in and tell us about it and possibly another plant engineer may have the answer to your problem.—Editors

For example, Kaylo Heat Insulation reduces inventory requirements because:

1. Wide effective temperature range —up to 1200° F.—eliminates the need for combination coverings in nearly all operating conditions.

2. Simplified Dimensional Standards allow nesting.

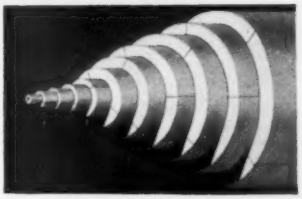
3. Unmatched selection of shapes and sizes reduces the number of pieces required per job.

Kaylo Heat Insulation reduces installation costs because:

4. The material is lightweight, strong and easily handled.

5. It is easy to cut and fit with standard tools.

Kaylo Heat Insulation is a hydrous calcium silicate—the heat-saving material that is revolutionizing insulation practice with its outstanding combination of advantages. Get all of the facts now.



Simplified Dimensional Standards mean that O. D.'s of insulation correspond to O. D.'s of standard pipes, assuring proper fit for nesting, when necessary. With this system of snug nesting, Kaylo Heat Insulation assures fits for all operating conditions, requires less items—reduces inventory stocks.

WRITE FOR FREE BOOK—"Kaylo Heat Insulation." Address: Dept. N-306, Owens-Illinois Glass Company, Kaylo Division, Toledo 1, Ohio.

KAYLO® **... first in calcium silicate**

...pioneered by OWENS-ILLINOIS **Glass Company**

MAIN OFFICE: TOLEDO 1, OHIO — KAYLO SALES OFFICES: ATLANTA • BOSTON • CHICAGO • CINCINNATI • CLEVELAND • DETROIT HOUSTON • MINNEAPOLIS • NEW YORK • OKLAHOMA CITY • PHILADELPHIA • PITTSBURGH • ST. LOUIS • WASHINGTON

NEW! Type NPLAB plug-in breaker panelboard...

One basic unit meets majority of lighting and appliance branch circuit application requirements without special adaptation

NOW, WESTINGHOUSE OFFERS YOU...

1. Industry's first Thermal Magnetic "De-ion" Plug-in Quicklag® Circuit Breaker—superior protection, proved efficiency.
2. Available for 1-phase, 3-wire, 115/230-volt SN, 3-phase, 4-wire, 120/208-volt SN services with 15 to 50-ampere, 1 pole branch breakers. (2 pole independent trip branch breakers available by adding handle extensions to two 1 pole breakers.)
3. Quick-make, quick-break action—fast, positive, safe.
4. New circuit breaker smaller than conventional Quicklag types—saves critical panel space.
5. New Type NPLAB Plug-in Panelboard smaller than conventional-type NLAB Panelboards—reduces job costs.
6. Permanent visible-phase identification on 3-phase, 4-wire panelboards, during and after installation; no guessing about load balancing.
7. Snap-on covers for neutral bar and main breaker—real time savers.
8. Rigid mounting of panel chassis assembly—offers a lifetime of protection against misalignment, breakage, accidents.

Westinghouse Type NPLAB Plug-in Panelboards have the flexibility, in one basic unit of standard design, to meet the majority of lighting and appliance branch circuit requirements with minimum engineering or special construction. Where else can you buy economical "De-ion" AB Circuit Breaker protection, fully pre-assembled into Westinghouse quality-built Panelboards?

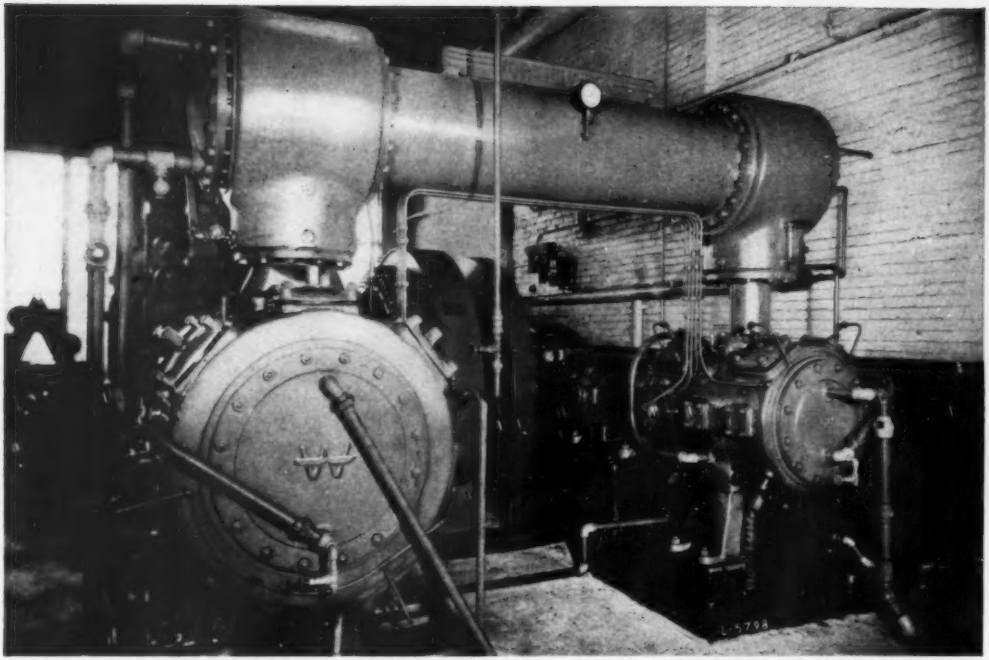
Get in touch with your Westinghouse Representative, or write for B-5644, Westinghouse Electric Corporation, Box 868, Pittsburgh 30, Pa. J-93486

YOU CAN BE SURE... IF IT'S Westinghouse

"DE-ION" BREAKER PANELBOARDS

New Westinghouse Type NPLAB Plug-in Panelboard —smaller than conventional-type NLAB Panelboard.

New Westinghouse Quicklag "P" Plug-in AB Circuit Breaker—smaller than conventional Quicklag Breaker.



WORTHINGTON DC-2 HORIZONTAL AIR COMPRESSOR—One of three compressors that supply air for blowing, grinding, air hoist, spraying, as well as for general foundry and machine-shop applications.

High-efficiency operation doesn't "just happen"!

There are important reasons why this Worthington compressor assures an economical, uninterrupted supply of air

How can an industrial plant be sure the compressors that make up its air supply are efficient—that they will provide all the air needed *when* it's needed at lowest possible cost? Many companies have made sure by selecting Worthington. And one of the biggest reasons they're getting maximum efficiency out of their installation is Worthington's Five Step Variable Capacity Control. Here's why:

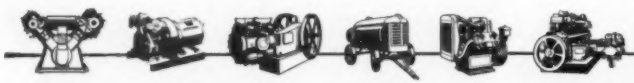
WORTHINGTON'S 5-STEP VARIABLE CAPACITY CONTROL

This unique Worthington control uses Worthington's by-pass principle of unloading so that suction valves are held open during partial-load periods, and cool air or gas is passed at suction pressure in and out of cylinders without compression. *The compressor works no harder than is necessary to meet the load demand.*

The advantages of this Worthington control are many. *Power is saved* at partial load conditions because unloading losses are reduced. *Operating temperatures are lowered* due to the cooling effect of by-pass air. *Carbon deposits are greatly reduced*, so valve trouble is virtually eliminated. *Lubrication is improved* so that cylinder wear is less.

Worthington—long in the compressor business—is constantly working to put even greater efficiency into these sturdy units. By specifying Worthington you automatically specify *maximum efficiency*. Write for Bulletin L-675-B1B to *Worthington Corporation, Compressor Division, Buffalo 5, New York.*

K.2.3



No Other Compressor Will Outperform a Worthington

WORTHINGTON

Compressors

KEEP THE DIRT *out!*

with **SARCO**

PIPE LINE STRAINERS

Unretouched photograph of the screen of a Sarco Strainer, exactly as found, after brief service in a pipeline. Brimful of scale, rust and pipe dope.

The most complete line

available anywhere . . .

As manufacturers for more than 30 years of steam traps, heating specialties and temperature regulators, we have long been keenly aware of the necessity of protecting such mechanisms from damage by foreign matter in pipe lines carrying condensate, steam, air, gas, water, brine, ammonia, oil and other fluids.

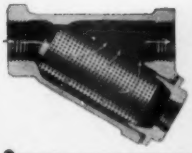
Strainers quickly pay for themselves by preventing costly shutdowns and heavy repair bills.

Sarco strainers have large capacities and offer minimum resistance to flow. They can be had in sizes from ¼" to 10" and larger, for all commercial pressures.

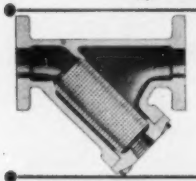
Bodies are of cast iron, semi-steel, cast steel, bronze or cast molybdenum steel. Screens are made of various metals with perforations as required.

Furnished with screwed, flanged, socket weld and sil-braze connections.

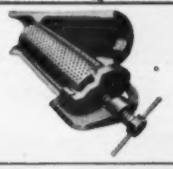
Catalog 1200-4 free on request.



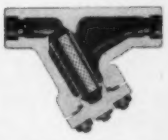
Sarco type SB and SBH strainers with screwed connections. Bodies of cast iron or bronze semi-steel or cast steel. Screens of brass, phosphor bronze, mild steel, stainless steel, or monel. Sizes ¼" to 6". For any commercial pressure.



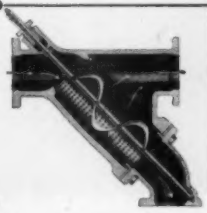
Sarco Type D Strainers with flanged ends. Bodies cast iron standard to 125 psi, or extra heavy to 250 psi. Sizes 2" to 10".



Sarco Type SB Yoke style strainer, for low pressure fluids, such as fuel oil. Standard on many oil delivery trucks. Screen instantly removable for cleaning. Cast iron body and cap, screens as desired. Sizes 2" to 3".



For pressures to 600 psi —Sarco Strainers built to meet Navy specifications. Sizes ¼" to 8", with screwed, sil-braze, socket weld or flanged connections. Bodies of cast valve bronze, cast steel, or cast carbon molybdenum steel.



Sarco Type SRS Scraper Strainer, hand-operated or motor driven, sizes ¾" to 8". Screen is scraped clean without interrupting flow or exposing the product to air contamination.

SARCO improves product quality and output

SARCO COMPANY, INC. ● Empire State Bldg., New York 1, N. Y.
REPRESENTED IN PRINCIPAL CITIES • SARCO CANADA, LTD., TORONTO 8, ONT.

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G-E Testing Instruments for Your Every Need

TWO NEW RANGES PERMIT WIDER APPLICATION

1 Motor Starting Current Measured With NEW AK-1A Volt-ammeter

Now, with new pointer stop and additional voltage and ampere ranges, the new AK-1A hook-on volt-ammeter is an even more versatile a-c testing instrument. The pointer-stop permits reading of motor starting currents. You can use your AK-1A volt-ammeter for spotting overloaded feeders, open fuses, and improper operation of circuit breakers.

Ranges: 0-7.5/30/75/300/750 amperes
0-150/300/750 volts

Accuracy: ±3% full scale.

Extra-sturdy construction assures years of service.

Weight: 3½ pounds.

PRICE: $66.75*

KILOWATTS ARE CHECKED IN OVERLOAD AREAS

2 Check Kilowatts Directly With Compact AK-2 Hook-on Wattmeter

Both single and polyphase circuits can be measured quickly and easily with this hook-on wattmeter. Ideal for trouble-shooting power surveys and load tests, this instrument can be used to make sure that motors operate at rated capacity. In addition to measuring kilowatts, this AK-2 hook-on wattmeter will measure vars in balanced three-phase circuits.

Ranges: 0-3/6/20/60/200/300 kw
15-600 amperes
100-600 volts

Accuracy: ±5% full scale

Weight: 4 pounds.

PRICE: $84.75*

AK-3 SIMPLIFIES CAPACITOR INSTALLATION

3 Spot Power Losses Easily With Type AK-3 Power-factor Meter

This new hook-on power-factor meter enables you to measure power factor without interrupting service. The AK-3 can be used on any balanced 3-phase circuit. When making capacitor surveys, you'll find the hook-on power-factor meter a valuable time saver. Improved power factor means relief to overloaded feeder circuits and transformers.

Ranges: 100-600 volts
15-600 amperes

Accuracy: 0.05 PF

Weight: 4½ pounds

PRICE: $84.75*

4 Quickly Determine The Phase Sequence of Polyphase Circuits

A handy, pocket-sized phase sequence indicator for determining the phase sequence of polyphase circuits is designed to save time for construction and maintenance men, trouble shooters, test men, and engineers. To use—merely connect the three leads to correct voltage terminals; one lamp will glow to show the direction of phase sequence.

Ratings: 120/240/480 volts or
120/240/600 volts

Weight: only 22 ounces

Dependable: has no moving parts or fragile filaments.

PRICE: $28.14 OR $31.77*

TO OBTAIN READING SIMPLY CONNECT THREE LEADS

5 Lighting Circuits Easily Measured By High Accuracy AC Portable

Used for both testing and maintenance work these compact high accuracy portables are ideal for lighting surveys. Small in size, they are easy to carry and store. Just the right amount of damping gives you maximum ease of reading. The AP-9 is available in almost all ranges as voltmeters, ammeters, milliammeters, single-phase wattmeters, and also with pointer-stop mechanism.

Accuracy: ¾ of 1% full scale for AP-9 (a-c)
½ of 1% of full scale for DP-9 (d-c)

Weight: about 2½ pounds.

PRICE: $53.00 AND UP*

ACCURATE TO WITHIN ¾ OF 1% OF FULL SCALE

6 Regulator Surveys Simplified With 30-day Type CF Inkless Recorder

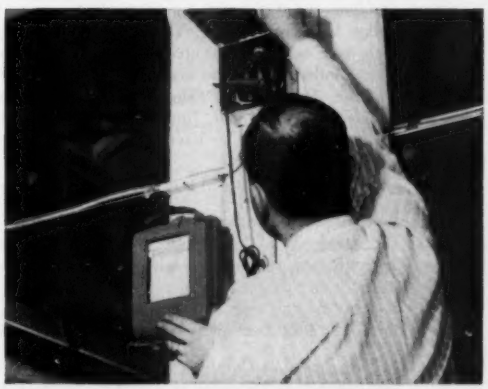
With the Type CF Inkless Recorder one man can supervise the power requirements for an entire plant. Charts last up to 30 days; no ink to freeze or evaporate; available in a variety of voltage ranges; weather seal and temperature compensation permit use out-of-doors. Checking regulators or making plant surveys is made easy with this lightweight portable.

Accuracy: Up to ±1½% full scale.

Available for a-c or d-c operation.

Weight: only 12 pounds.

TYPICAL PRICE: $110.00*



WEATHER SEAL PERMITS OUT-OF-DOORS OPERATION

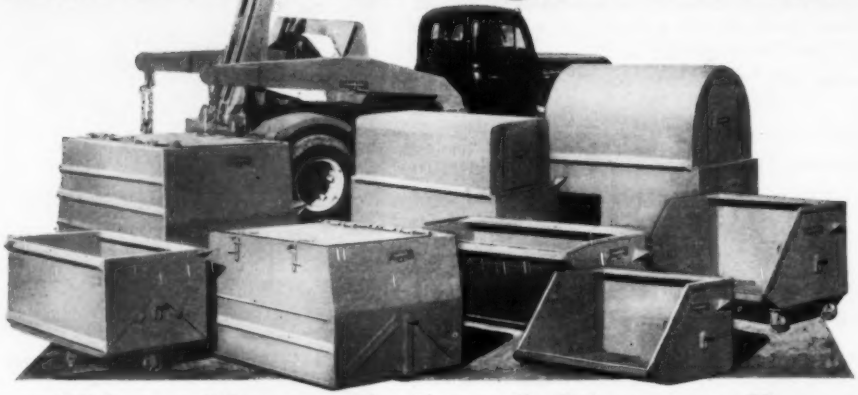
*Manufacturer's suggested retail price.

602-240

For further Information, contact your nearest G-E Apparatus Sales Office, Agent, or Distributor

GENERAL ELECTRIC

One DEMPSTER-DUMPSTER Serves Scores of Containers . . All Designs . . . All Sizes . .

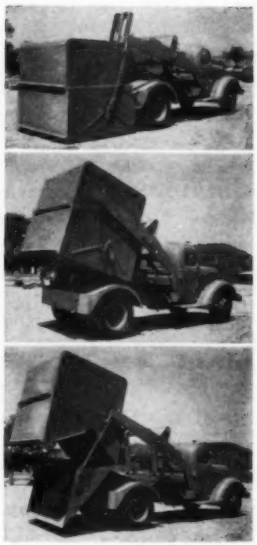


Handling Materials of Almost Every Description at the Lowest Possible Cost!

One Dempster-Dumpster mounted on one of your trucks serves any required number of big detachable Dempster-Dumpster Containers spotted at convenient materials accumulation points inside and outside your buildings. The capacity of these containers range up to four times greater than the average dump truck body. They are built in a wide variety of designs best suited to the materials handled—be they solid, liquid or dust . . . trash or rubbish . . . bulky light or heavy. The truck-mounted Dempster-Dumpster, with only one man, the driver, picks up one pre-loaded container after another, hauls it to destination where materials are dumped or load set down intact. The Dempster-Dumpster may handle raw materials on one haul, liquids on another, trash and rubbish on another, etc. It's like having one truck with 15, 25, 65 or 100 different bodies.

This is the *Dempster-Dumpster System*—the modern method of bulk materials handling. It is saving thousands of dollars annually for hundreds of plants in every type of industry because it: Eliminates 3 to 5 conventional trucks and crews—reducing cost of truck equipment and operation accordingly. . . Eliminates standing idle time of trucks and crews. . . Eliminates re-handling of materials. . . Increases efficiency, sanitation and good housekeeping.

The *Dempster-Dumpster System* is, without question, the most efficient method of materials handling by truck ever devised! More efficient and lower cost materials handling in your plant may be simply a matter of getting the minds of your engineers and ours together. Write us now. The *Dempster-Dumpster System* is manufactured exclusively by Dempster Brothers, Inc.



WHEN A CONTAINER is full, the Dempster-Dumpster picks it up, hauls it to destination and dumps the materials or sets the load down intact. These three simple operations, shown above, are hydraulically controlled by driver in truck cab.

DEMPSTER BROTHERS - 1102 Shea Building - Knoxville 17, Tennessee

PITT CHEM *Quality Control*

assures you better, longer-lasting protection

Pitt Chem quality-controlled Tar Base Coatings have an unmatched record of performance in protecting industrial structures and equipment from corrosion. They're easy to apply, low in cost and effective against a wide variety of chemical and atmospheric corrosive conditions above and below ground. And these tough, durable protective coatings have up to ten times the film thickness of ordinary paints and last for years under conditions that usually cause ordinary paints to fail in months.

You can depend on Pitt Chem Tar Base Coatings for top uniform quality because we control every phase of production from coal to finished coating—in a plant designed *exclusively* for the manufacture of tar base coatings. That's your assurance of top-grade application characteristics, uniform bond and maximum protection. ● More product information, technical data, or field application assistance will gladly be sent on request.

Write For FREE
Corrosion Control Booklet

Tells where tar base coatings can save you money in your plant . . . what grades to use . . . how to apply them.

W&D 4096

PITT CHEM 101
A versatile, heavy duty coating that withstands severest corrosive conditions.

PITT CHEM 102
A thin, high gloss maintenance coating for steel and concrete surfaces.

PITT CHEM 103
A heavy duty coating for metal exposed to corrosive vapors, dilute acids and alkalis.

PITT CHEM 104
A fast drying, high gloss coating for equipment handling potable water.

PITT CHEM SYNTHETIC COATINGS

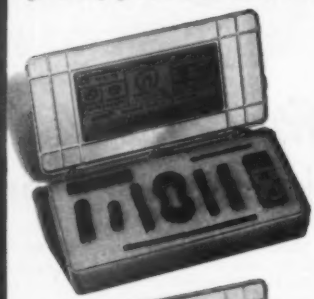
PITTSBURGH
COKE & CHEMICAL CO.

COAL CHEMICALS • AGRICULTURAL CHEMICALS • PROTECTIVE COATINGS • PLASTICIZERS • ACTIVATED CARBON • COKE • CEMENT • PIG IRON

Get this FREE

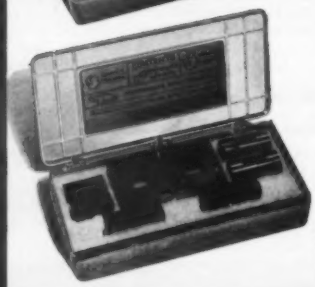
MAGNET ASSORTMENTS

available for plant, product and maintenance engineers!



SHOP PACKAGE No. "1"

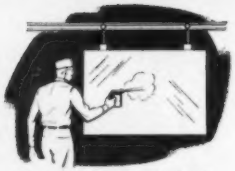
Contains 48 Carboloy Permanent Magnets; 8 styles, 3 pairs each for hundreds of shop uses. Up to 2 lbs. "pull" per magnet. PRICE: $10.00



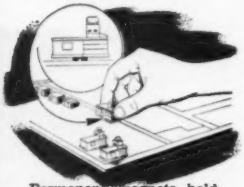
SHOP PACKAGE No. "2"

Contains 18 Carboloy Permanent Magnets; 4 styles, 2 pairs each, and 1 style, 1 pair. Large size for heavy-duty "pull" from 3 lbs. to 12 lbs. per magnet. PRICE: $15.00

Use convenient coupon at right to order as many Shop Package "No. 1" and Shop Package "No. 2" assortments of Carboloy Permanent Magnets as you require.



Permanent magnets hold steel plate to conveyors for painting.



Permanent magnets hold models in place on plant layouts.

Permanent magnets hold work firmly in place for drill press or grinding operations.

Permanent magnets recover tools from dip and coolant tanks.

(See your Magnet Idea Kit for complete details.)

"Carboloy" is the trademark for the products of Carboloy Department of General Electric Company

CARBOLOY

PERMANENT MAGNETS

FREE KIT shows how stock-size Carboloy Permanent Magnets can speed up general shop work; save time and money!

This handy, file-size, loose leaf kit of permanent-magnet ideas tells in easy-to-understand fashion just what permanent magnets are and what they do. Contains six useful magnet ideas that you can put to work at once to save time and money in your shop. Each magnet idea is fully detailed from application to magnets used and how to apply them—complete with diagrams and full instructions for simple, easy assembly in your own shop. We'll send you, too, from time to time, additional free case histories to help you build up your file of money-saving ideas using permanent magnets.

You'll find Carboloy Permanent Magnets are powerful lifting, holding, separating devices that eliminate clamps, jigs, vises, fixtures, other costly, intricate units.

They speed up production. Retrieve tools from tanks . . . do any number of jobs better, cheaper, faster. Cost nothing to operate. *Last forever!* Give powerful energy *without* wires or operating parts.

You can get low-cost Carboloy Permanent Magnets in many sizes and shapes for 1001 uses. Put magnets to work for you *now—plant-wide*. Contact a Carboloy engineer in your area, or use the coupon below to get your copy of the new Magnet Idea Kit. For handy, low-cost assortments of Carboloy Permanent Magnets to lift up to 12 lbs., order shop packages shown at left. Carboloy Department of General Electric Company, Detroit 32, Michigan.

Mail Coupon Today!

CARBOLOY
DEPARTMENT OF GENERAL ELECTRIC COMPANY

PLANTS AT DETROIT, MICHIGAN; EDMORE, MICHIGAN; AND SCHENECTADY, NEW YORK

11199 E. 8 Mile Ave., Dept. C, Detroit 32, Mich.

☐ Please send free Magnet Idea Kit. ☐ Please send ( ) Shop Packages "1" at $10.00 each.
☐ Please send ( ) Shop Packages "2" at $15.00 each.
Enclosed is a ☐ Check ☐ Money Order ☐ Purchase Order for $_____. ☐ Please send invoice.

Name_____ Title_____

Company_____

Address_____ City_____ Zone____ State_____

ENGINEERED BELTING CUTS COSTS 50%

■Ten years ago an Eastern foundry tried and discarded four different types of conveyor belting. Extremely hot core sand made replacements frequent and expensive. An Imperial Belting engineer analyzed the operating conditions and recommended Imperial's INSULATED SAHARA, a belting manufactured especially for carrying hot, abrasive materials. Insulated SAHARA outlasted all belts previously tried by 2 to 1. Since 1939 no other brand of belting has been used.

Unexcelled for Hot Materials

This belt is made of heavy-duty tight woven duck combined with asbestos and special insulating material and then impregnated. Insulated Sahara handles materials from 300° F. to 450° F.; Super-Insulated Sahara, from 450° F. to 600° F. Imperial's double-stitched Inner-Locked construction positively prevents ply separation.

Write for Data Sheet 47-8 and prices.

IMPERIAL BELTING CO.

1759 S. Kilbourn Ave., Chicago 23, Ill.

Imperial
INNER-LOCKED
BELTING
Engineered Belting—
The Right Belt for Each Job

BACKTALK ABOUT PAST ISSUES

Paging Mr. Houdry

PLANT ENGINEERING:

"We have read with considerable interest your article, 'Could Your Plant Be Run On Its Waste Gases?' in the July issue of PLANT ENGINEERING.

"We would like to know where more information on this process is available and whether Mr. Houdry would be willing to furnish projected savings on an oven installation of our type. Apparently the Enamelstrip Corporation of Allentown, Pennsylvania, about whom the article was written, may have some information which they may be willing to furnish. I would appreciate it if you would name the party to contact."

Hamilton Manufacturing Company
N. L. Schmeichel
Director of Manufacturing

PLANT ENGINEERING:

"In the July issue of your excellent magazine we read an article explaining how the catalytic device of Eugene L. Houdry functions. We are very much interested in pursuing the possibilities of using such a device in our plant.

"With this in mind, we would very much appreciate your letting us know the business address of Mr. Houdry in order that we may take up with him our requirements."

Globe Venetian Blind Corporation
A. A. Radel, Vice President
Manufacturing Division

Mr. Fryer Got 'em

PLANT ENGINEERING:

"Each time the monthly issue of PLANT ENGINEERING reaches this office, we find many interesting articles which are educational and make very good reading. In fact, we are steady customers for requests for various reprints of articles that appear in your magazine.

"The American Material Handling Society is internationally made up of 29 chapters from Boston to Los Angeles and Chicago to Houston including Toronto, Montreal and Vancouver, B. C. Our membership consists of 2550 material handling men.

"We have a headquarters membership which comprises 21 'members-at-large.' These men are interested in material handling but are not located near a chapter. As well as having members in the United States, we also have them in England, France, Italy, Finland and Australia. We service these men with books, catalogues and reprints which will be of interest to them in regard to their particular field of materials handling. If they have any specific problems they are free to write to us for information.

"Our Society is trying to establish for its members a sales department with responsibilities for obtaining a bulk discount on magazines, books and catalogues. Since we find PLANT ENGINEERING so helpful and interesting we thought perhaps our membership would like to subscribe to it. Is there any specific discount that could be given our membership? If so, what would the price be?

"As we mentioned earlier that from time to time we write in for reprints the same is true in this case. Would it be possible for us to obtain 25 reprints of each of the following articles which appeared in the August issue of PLANT ENGINEERING: Safety Is Sprayed on Glass Panes; Layout, Equipment, Methods—Spell Warehousing Efficiency; Practical Materials Handling Ideas; Planned Materials Handling at Westinghouse; Conveyor Delivers Mail-Up & Down."

American Material Handling Society, Inc.
Arthur E. Fryer,
Administrative Secretary

Mr. Frank Got 'em, too

PLANT ENGINEERING:

"The June 1952 issue of PLANT ENGINEERING, carried the following article, 'Study in Material Handling, The Job That Timken Did.'

"Mr. Wier, the man who helped in the preparation of this article, is the newly elected National Treasurer of the American Material Handling Society.

"The American Material Handling Society, publishes its own technical section, 'Material Handling Engineering,' in *Modern Material Handling* magazine. We would like very much to publish the above story, either whole or in part, in our section, for the benefit of such of our members that do not receive your magazine.

"Would it be possible for you to provide us with the material and necessary permission to do this? Mr. Wier has already given his consent."

Material Handling Engineering
William G. Frank, National Editor

On Glass Pane Coating

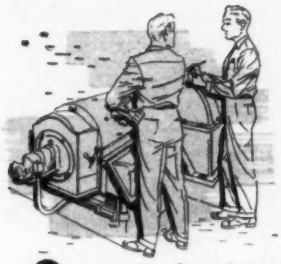
PLANT ENGINEERING:

"In your August, 1952 issue an article appeared captioned, 'Safety Is Sprayed on Glass Panes.'

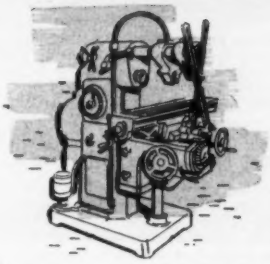
"As the agency for the Mississippi Glass Company of St. Louis, world's largest manufacturer of rolled, figured and wired glass, we think it should be pointed out that in any opening where Fire Underwriters requirements call for wired glass, that neither plain glass or glass coated with plastic should be

GULF PERIODIC CONSULTATION SERVICE

gives you expert help on every phase of lubrication

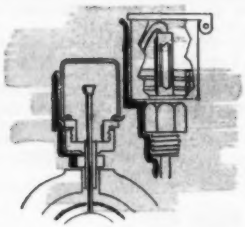


❶ surveys of equipment

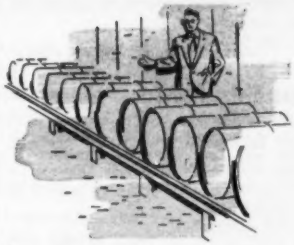


❷ specific recommendations

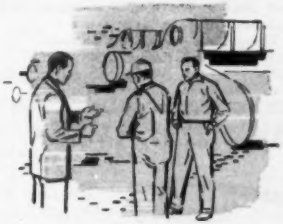
❸ lubrication charts



❹ application methods



❺ storage and handling



❻ individual problems

Gulf's comprehensive lubrication plan can help you reduce costs straight down the line. Call your nearest Gulf office today.

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PITTSBURGH 30, PENNSYLVANIA

GULF SERVES INDUSTRY

YOUNG
OIL COOLERS
Save Waste Heat!

Young "OSH" Unit Oil Cooler

Here is the economical way to cool lube oil when water is at a premium or when waste heat can be used to warm room interiors. Young Unit Oil Coolers do double-duty . . . serve as heat exchangers and unit heaters.

Typical Young-quality design and construction include: a non-ferrous tube-and-fin core, one-piece cast iron headers, spring suspension of cooling core for free expansion and contraction, sturdy welded mounting brackets, etc.

These Young units cost no more than shell and tube bundle heat exchangers—can pay for themselves quickly in waste heat recovery.

SHELL AND TUBE BUNDLE LINE IS COMPACT, EFFICIENT

For your normal oil cooling requirements, you'll find Young shell and tube bundle heat exchangers are standardized for economy, precision-built for efficiency.

YOUNG

Heat Transfer Products for Automotive and Industrial Applications.

Young Quality

Heating, Cooling, and Air Conditioning Products for Home and Industry.

T. M. REG. U. S. PAT. OFF.

YOUNG RADIATOR COMPANY

YOUNG RADIATOR COMPANY
Dept. 322-K, Racine, Wis.
☐ Send me your catalog No. 3550 on Unit Oil Coolers.
☐ Include Catalogs No. 1049 and 1149 on Shell and Tube Bundle Heat Exchangers.

Name_____

Company_____

Address_____

City_____ Zone____ State____

employed. Normal city building codes clearly specify the areas in which wired glass should be installed.

"Secondly, the test used by the cereal manufacturer whose experience was cited in the article would not be considered a proper yardstick of measurement as to the breakage factor. He used a rawhide hammer, whereas the impact that usually breaks glass is caused by a small object (such as a stone hurled by a mischievous boy) striking the glass with considerable velocity. You can readily see that the effect would be entirely different from that caused by blows from a rawhide hammer having a large rounded surface.

"It should also be pointed out that glass coated with plastic has no fire retardant qualities whereas wire glass which qualifies as does Mississippi's, as Fire Retardant No. 32, helps to bottle up fires and prevent the spread of conflagrations. You can appreciate that ordinary glass, coated with plastic, could not conceivably qualify in this respect.

"We appreciate that you were merely relaying the experience of a specific manufacturer and that the article was not to be construed as representing the attitude of PLANT ENGINEERING editors."

Ralph Smith Advertising Agency
R. W. Smith

About Glass Longevity

PLANT ENGINEERING:

"The article 'Safety Is Sprayed on Glass Panes' evidently was concerned chiefly with the safety angle. My thought was whether or not data is available on the life of the glass panes as affected by the application of plastic.

"If you do have any such information I would appreciate your passing it on to me along with data on the actual application of the plastic itself, such as make or source of the material as well as the applicator."

Indiana Steel & Wire Company
Melvin Altmark, Plant Engineer

More About Panes

PLANT ENGINEERING:

"In the August issue of your magazine there was an article by Franklin E. Crooks of the Post Cereals Division on the application of plastic paints to glass window panes.

"We would be very interested to learn the name of the liquid plastic which was used in their plant as well as any other pertinent details as to the application and continued maintenance of these window panes."

Fraser Paper, Limited
J. S. Overbagh, Asst. Mill Manager

Names on Request

PLANT ENGINEERING:

"In the August issue of PLANT ENGINEERING, you describe what one company used on glass to prevent excessive shattering and breaking. This method is using a plastic material.

"We would like to know if we could find out the type of materials used in this particular instance. The first one he mentioned was blue. We probably would prefer a blue to a clear. In any event, we would like to have this information if you could give it to us, or tell us to whom we could write."

Scottdale Mills
J. A. Fife, Superintendent

BACK TALK

A Problem That's Growing

PLANT ENGINEERING:

"Have you published articles dealing with the problem of record storage in industrial plants? If so, could I have reprints or tear sheets?

"The problem I have in mind is the annual accumulation of transfer cases containing files of correspondence, orders, invoices, etc., which must be kept for a reasonable number of years. I do not refer to engineering drawings, machine records and other data that must be stored practically indefinitely.

"Any information along these lines would be much appreciated and I would ask you to send it to my attention."

Canadian Ingersoll Rand Co. Ltd.
E. T. Harbert,
Asst. to Works Manager

Answer Went Airmail

PLANT ENGINEERING:

"We are interested in an article which appeared at the top of page 116 in the August issue of PLANT ENGINEERING. Will you kindly advise us the name and address of the manufacturer of the M. S. A.—Lamb air movers regarding which this article was written.

"This type of ventilation equipment apparently will serve a need in our Weld Shop at this plant, and we shall appreciate your prompt co-operation in furnishing us with the desired information."

The Marley Company, Inc.
J. W. Hoover, Plant Engineer

This Makes 450

PLANT ENGINEERING:

"I am very much interested in the article, 'How Necco Plans Its Plant Engineering' as my work—as Engineering Planning Officer of the Lewis Laboratory of the National Advisory Committee for Aeronautics—is concerned with similar problems.

"I will appreciate receiving the complete 8-page reprint of the article.

Lewis Laboratory *Charles S. Moore*

But, Suppose You're Broke?

PLANT ENGINEERING:

"You published an article in "Round About," August, 1952, on a cross hatching idea that is years old. A much simpler method is to place a coin of desired size in the triangle to obtain the required cross hatch—this needs no special gadget, if you have spare change about. A quarter fits a 6 in. 45 deg. or an 8 in. 30, 60 deg.

Ortho Pharmaceutical Corp.
L. D. Cosgrove, Engineering Dept.

A belt stacker designed by Jeffrey Engineers becomes an important part of a new-type storage system installed in Florida. Result: Continuous, dependable operation and accurate blending.

Saving: A unique system, the facilities of which prevent delay of railroad equipment and provide better service to customers by permitting quicker deliveries of more-accurately-blended phosphate rock.

How it works: From track hopper rock is fed at 600 to 800 T.P.H. on to a Jeffrey 36" belt conveyor, running up an 80-foot high Stacker which pivots (see photo) over a wide semicircle. Rock is dropped on storage piles consisting of various grades at different points. Grades are blended by proportioning through gates and reclaimed by other Jeffrey belts operating in tunnels under piles. Rock can be removed at controlled rate from any point in the pile, or at several points at once.

This is just one of the many Jeffrey-equipped jobs on which our engineers projected an ingenious application of the Belt Stacker. For applied engineering on those tough assignments — call on Jeffrey.

- **Car Pullers** **Bucket Elevators** **Grizzlies** **Crushers**
  Pulverizers **Magnetic Separators** **Chains** **Dryers**
  Coolers **Stackers** **Conveyors** **Packers**

THE JEFFREY MANUFACTURING COMPANY

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Beckley, W. Va. Buffalo 2 Cleveland 15 Forty Fort, Pa. Jacksonville 2 Philadelphia 3 Salt Lake City 1
Birmingham 3 Chicago 1 Denver 2 Huntington, Ky. Milwaukee 2 Pittsburgh 22

Jeffrey Mfg. Co. Ltd., Montreal, Canada
British Jeffrey-Diamond Ltd., Wakefield, England
Jeffrey-Galion (Pty.) Ltd., Johannesburg, S. A.
The Galion Iron Works & Mfg. Co., Galion and Bucyrus, Ohio
Galion (Great Britain Ltd.), Wakefield, England
The Ohio Malleable Iron Co., Columbus, Ohio
The Kilbourne & Jacobs Mfg. Co., Columbus, Ohio

1877 75 YEARS 1952

Modern Power Centers

simplify change-over to higher voltage!

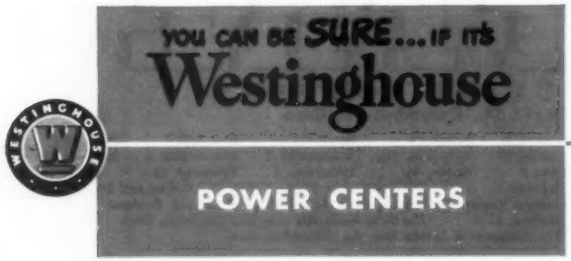
Section by section change-over of their plant from 220 to 440 volts was the deciding factor when a large Midwest steel fabricator installed Westinghouse Dry-Type Power Centers. But there were other considerations behind the move.

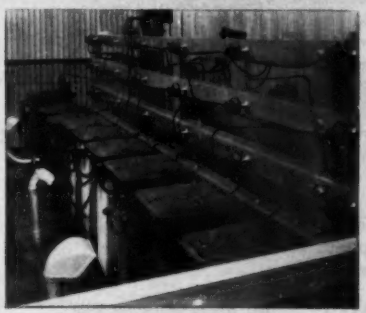
In the first place, operations had been growing steadily for the past six years, and plans called for further expansion. The old substations, having grown like Topsy, were trouble spots.

They chose Westinghouse Dry-Type Power Centers because the lightweight, compact units could be installed on raised platforms within the plant, close to the loads they serve. This eliminates the necessity for vaults, catch basins and flues which might impede the flow of work. Shorter secondary leads resulted in a copper saving that covered a good share of the installation cost. Shorter secondaries, too, reduced line losses, improved regulation.

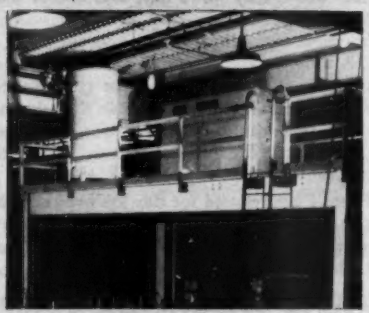
Installation of separate power centers, each serving its own area, made the change-over easy, without interrupting production in other sections. And the flexibility of the new power centers gives greater freedom for future expansion.

Check your own distribution system. You, too, may find excessive losses, poor regulation and outmoded equipment adding hidden operating costs. Your Westinghouse representative will be glad to show how you can make modern power centers pay. Call today, or write for booklet B-4428, Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa. J-70636

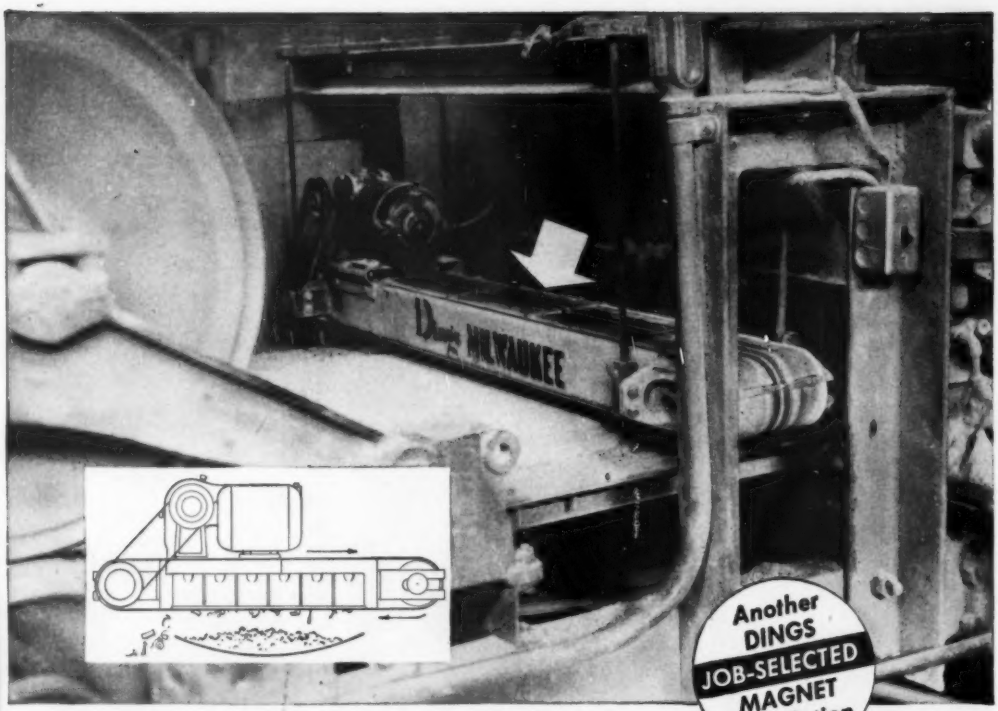




One of the outdoor substations which "just grew" as the load expanded, until they became costly, inflexible and inefficient. Modern power centers replaced these; eliminated their problems.



Westinghouse Dry-Type Power Centers, located on raised platforms close to the load they serve, provide maintenance-free dependability and economy, with flexibility for future expansion.



ASBESTOS MINUS IRON EQUALS SALES GOLD

DINGS MAGNETS DO THE SUBTRACTING

HOMEOWNERS like the superior quality of asbestos shingles but if the shingles don't look like wood, they won't buy, says one of the biggest manufacturers of asbestos building materials in the business. So the shingles are passed through engraving rolls to give them the textured appearance of wood. A problem raised by this process and solved by a Dings self-cleaning non-electric Perma-Plate magnet (big illustration) is TRAMP IRON—nuts, bolts, wires, etc. which get in the asbestos during previous processing. This iron would wreck the rolls, alter the pattern and eventually cause rust spots in the installed material. The Perma-Plate gets it all out—automatically.

WHY was the Perma-Plate selected for this job over all other types and styles of magnets in the Dings line? *The specific application dictated its choice.* The magnet was "job selected." Whatever YOUR tramp iron problem, buy a Dings job selected magnet and KNOW it will be successful.

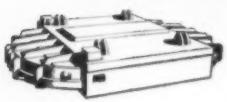
DINGS MAGNETIC SEPARATOR COMPANY
4766 W. Electric Ave., Milwaukee 46, Wis.

THE PERMA-PLATE (shown here without self-cleaning attachment) is non-electric, permanently magnetic. This magnet is particularly effective where the burden depth does not exceed 3".

THIS CATALOG HELPS YOU TO "JOB SELECT" A MAGNET

Is the material you want de-ironed a solid . . . semi-solid . . . liquid? Is it carried in chutes . . . ducts . . . conveyor belts? Catalog 3000-B lists Dings complete line by application, describes all Dings magnets from the low cost, non-electric "Perma" Plate magnet to the most powerful magnetic separators known. Send for it today.

DINGS MAGNETS

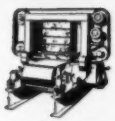


Rectangular

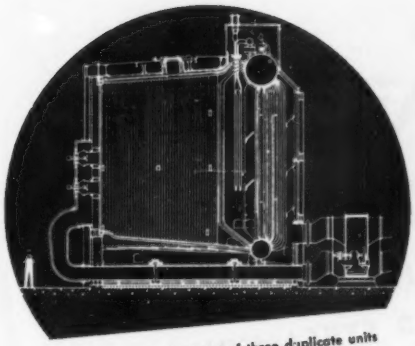
High Intensity Induced Roll

Non-Electric and Electric Pulleys

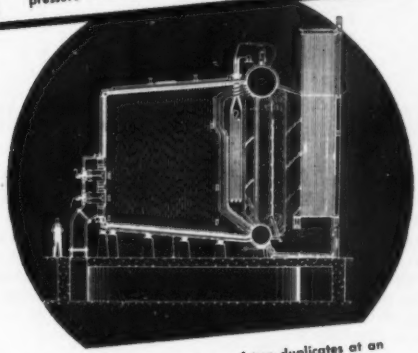
Non-Electric Drums



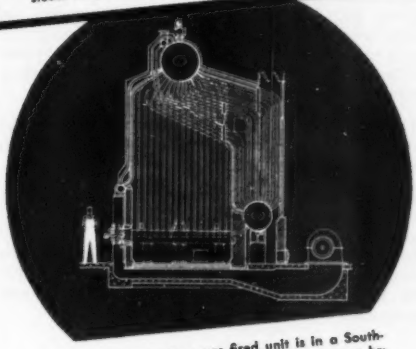
High Intensity Type EBK Crossbelt



VU-50 Boiler — This is the latest of three duplicate units installed in this Western plant. Fired with oil or refinery gas. Capacity — 250,000 lb of steam per hr; operating pressure — 565 psi; steam temperature — 650 F.



VU-50 Boiler — This unit is one of two duplicates at an Eastern plant. They are fired with oil or gas. Capacity — 100,000 lb of steam per hr; operating pressure—550 psi; steam temperature — 700 F.



VU-10 Boiler — This oil or gas fired unit is in a Southwestern plant. Capacity — 60,000 lb of steam per hr; operating pressure — 150 psi; steam temperature — 465 F. VU-10 capacities range from 10,000 to 60,000 lb of steam per hr.

in Industry after Industry Leaders choose VU

The story's the same, wherever you go . . . in industry after industry . . . wherever steam is used . . . C-E Vertical-Unit Boilers will be found in the plants of many of the leading companies.

The Petroleum Industry, for example . . . one of the largest users of steam for process and power . . . has installed VU Boilers with an aggregate capacity of many millions of pounds of steam per hour. The list below gives evidence of the widespread acceptance of the VU Unit among leaders of the petroleum industry.

Several of these companies have ordered and reordered VU Boilers over a period of years. They know by actual experience what they can expect from a Vertical-Unit Boiler. One company, for instance, ordered its first VU in 1937, its second in 1940, two more in 1942 and another in 1947. A sixth unit was installed in 1950.

So, if you use steam . . . from 10,000 to 350,000 pounds per hour . . . for power or process, take your cue from the petroleum industry — or from any other field where steam is of primary importance. Investigate the lower steam costs you get with the advanced design . . . sound construction . . . consistent reliability of C-E Vertical-Unit Boilers.

Typical Group of Oil Companies that have purchased VU Boilers for one or more plants

Arabian American Oil Company
Cit-Con Oil Corp.
Cities Service Refining Company
Creole Petroleum Corp.
Esso Refinadora do Petroleos
Gulf Oil Company
Humble Oil & Refining Company
Magnolia Petroleum Company
Pan American Refining Company
Petroleos Mexicanos
The Pure Oil Company
Sinclair Refining Company
Socony Vacuum Oil Company
Stanolind Oil & Gas Company

COMBUSTION ENGINEERING — SUPERHEATER, INC.

200 Madison Avenue, New York 16, N. Y.

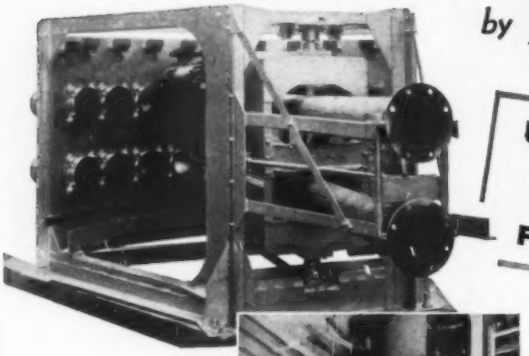
B-571A

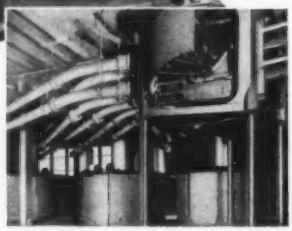
ALL TYPES OF BOILERS, FURNACES, PULVERIZED FUEL SYSTEMS AND STOKERS; ALSO SUPERHEATERS, ECONOMIZERS AND AIR HEATERS

DRY BULK-MATERIAL HANDLING

by The AIRVEYOR

USING NEW MOTORIZED PIPE-LINE SWITCHES FOR STREAM DIVERSION





Eight-way, duplex-motorized, pipe-line switch. Distributes fine and granular materials to eight bins. Eight lower tubes carry main material stream to bins; eight upper tubes, dust return stream to collector.

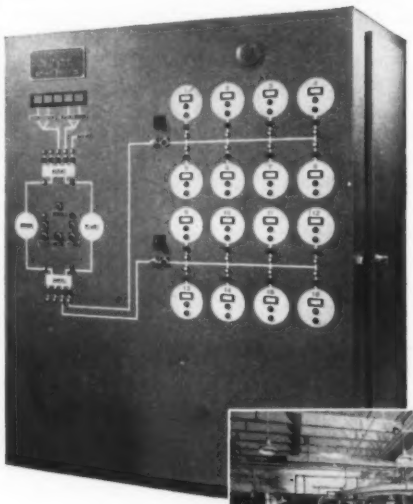
If you convey dry, fine or granular material in your plant, it can be done more completely, and above all, more efficiently by the Airveyor.

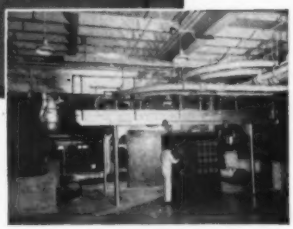
The Airveyor readily adapts itself to the most unusual plant layout and building design, because the system is not subject to the straight-line limitations of mechanical conveyors. It conveys vertically, horizontally, and around corners at rates varying from a hundred pounds to several tons a minute . . . a complete and dependable system for car and ship unloading, as well as in-plant distribution.

Where desirable, a master control board operates one or more motorized pipe-line switches, directing the flow of material from the desired intake point to the required distribution. Lights on the panel indicate routing of material, as well as full or empty bins. There is no limit as to the number of points to be served . . . motorized pipe-line switches can be had for vacuum or pressure systems, or a combination of both.

These switches are universal in application and move freely at all times; they're non-stalling, even when handling such materials as sugar or salt.

Investigate this convenient Airveyor method for handling dry, fine or granular material. A Fuller engineering study (proposal drawings and estimates) entails no obligation. It's part of Fuller's service—now in its 26th year—to help you solve your material-handling problems, efficiently and economically.





Airveyor control board with indicator lights. Simple push-button operation enables one man to remote-control two Airveyor systems from a central location.

●

FULLER COMPANY, Catasauqua, Pa.
120 S. LaSalle St., Chicago 3
420 Chancery Building, San Francisco 4

Fuller

DRY MATERIAL CONVEYING SYSTEMS AND COOLERS—
COMPRESSORS AND VACUUM PUMPS—
FEEDERS AND ASSOCIATED EQUIPMENT

A-140
1557

FOR CLASSY SHOPS

. . . OR BUSY PLANTS

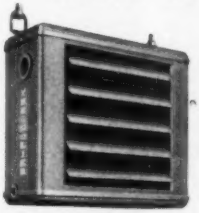
THERMOLIER UNIT HEATERS

The condensed table below is a quick guide to the selection of the correct Thermolier for specific conditions. The capacities, when motors are operating at normal speeds, are based on Standard Basis of Rating: 2 lb. steam pressure and 60° F entering air temperature.

Grinnell Thermoliers are tested and they are rated in strict accordance with rules of the Industrial Unit Heaters Association.

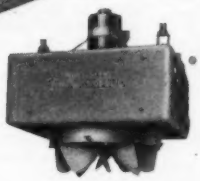
All Thermoliers can be operated at working steam pressures up to 125 psi and steam temp. up to 406° F.

A MODEL AND SIZE FOR EVERY PURPOSE

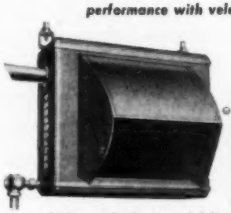


horizontal delivery

textile (horizontal delivery)



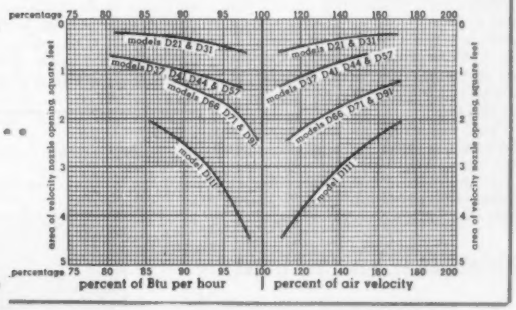
vertical delivery



velocity nozzle (horizontal delivery)

model	total heat delivered, Btu per hr	sq ft edr (nominal)	air velocity at exit, louvers open, lin. ft. per min.
horizontal delivery			
D21	35,600	148	786
D31	48,700	203	851
D37	62,200	259	753
D41	71,000	295	901
D44	84,100	350	887
D57	101,300	422	1016
D66	128,700	536	779
D71	151,700	632	977
D91	196,000	817	985
D111	275,300	1147	1048
Textile			
TX70	69,800	291	826
TX110	113,700	474	877
vertical delivery			
VA1042	50,800	212	1399
VA1045	73,600	307	1287
VA1065	109,400	456	1354
VA1075	145,600	607	1231
VA1101	185,000	770	1495
VA1111	257,000	1071	1631

performance with velocity nozzle ▶


percentage 75 80 85 90 95 100 120 140 160 180 200
models D21 & D31
models D37, D41, D44 & D57
models D66, D71 & D91
model D111
models D21 & D31
models D37, D41, D44 & D57
models D66, D71 & D91
model D111
area of velocity nozzle opening, square feet
0 1 2 3 4 5
percent of Btu per hour
percent of air velocity

GRINNELL

THERMOLIER UNIT HEATERS

CALL YOUR LOCAL GRINNELL DISTRIBUTOR

Grinnell Company, Inc., Providence, Rhode Island • Coast-to-Coast Network of Branch Warehouses and Distributors

Manufacturer of: pipe fittings • welding fittings • forged steel flanges • steel nipples • engineered pipe hangers and supports
Thermolier unit heaters • Grinnell-Saunders diaphragm valves • prefabricated piping • Grinnell automatic fire protection systems

PLANT ENGINEERS' DIGEST so those who rush may read and know what's new

Edited by E. B. Skubik

Pneumatic Material Transport

SOME of the world's most advanced ideas in milling have been put to use in the General Mills new whole wheat mill at Buffalo, New York.

For instance, air replaces bucket lifts in moving flour stock through

Stock collecting cyclones are of Swiss manufacture. Technician is observing material through transparent section

the mill. This makes the small plant the only wheat mill in the U. S. with pneumatic transport.

Air, carrying the stock, whistles through a network of streamlined 3½ in. tubes at a rate of 4,500 fpm. Bucket elevators in the mill used to move at only 340 fpm. Now, with this faster system, much less space is taken up by transport facilities.

A feature of the new mill is a set of cyclone collectors, made in Switzerland. (Pneumatic transport is used more extensively in Europe than in this country.) Fast moving, stock laden air enters the funnel-like cyclone chamber from the top and spins rapidly inside. The stock falls to the bottom and air continues out the top.

This, say engineers, is a highly efficient operation giving 99½ per cent complete separation of stock from the air. *From The Modern Millwheel, published by General Mills, Inc., Minneapolis, Minn.*

Maintenance of Industrial Trucks

SAFE MAINTENANCE of industrial trucks demands a place for everything and everything in its place. Designed for safe operation in the location of use, industrial trucks should instantly be withdrawn from use at the first sign of wear, part failure, overheating or spark emission from exhaust pipe.

They should be refueled, repaired and garaged only in separate, specified places. When trucks are repaired, parts should be used which are fully equal in safety factors to the parts used originally.

To prevent refueling in work areas when the truck runs out of gas, each truck should be furnished with a lock-type gas tank cap. A readily accessible fire extinguisher in good maintenance should be kept on each truck, preferably charged with carbon dioxide or dry chemical. In winter, only glycol-base antifreezes should be used.

A clean truck is a safer truck, so weekly steam cleanings are recommended to remove lint, oil or grease. All trucks should be thoroughly inspected at least daily. This can take place at the start of the day or at the end of each shift if the trucks are worked all shifts.

Water mufflers which prevent spark emission from backfires, a crucial problem in this field, must be filled daily, or as often as necessary to keep the water supply not under 75 per cent capacity.

Electric vehicles and gasoline trucks both require special examinations to check, where applicable, the battery wiring, controls, fuel tank, pump, carburetor, brakes, lights, and horn. *From release of National Fire Protection Association, 60 Batterymarch St., Boston, Massachusetts.*

Protection for Gas Cutting

GAS CUTTING of discs, flanges and other small plate articles presents the possibility of molten metal falling into ones footwear. A simple but effective set-up is recommended to ward off such an occurrence.

A standard size drum is filled partly with water and two pieces of angle iron are laid across the opening. The plate to be cut is then laid across the angle iron.

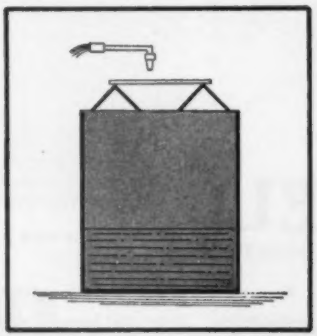


Diagram presents relative position of parts in suggested gas cutting set-up

The advantages of this arrangement are several: Molten metal does not scatter about, but falls into the drum. The heat of the cutting flame is localized. Pieces that have been cut out fall directly into the water to cool off and can be handled immediately. *From an article by Rudolf Glass in The Stabilizer published by the Lincoln Electric Co., Cleveland 17, Ohio.*

Safe Practice Kept Light Green

A department at the Sherman, Texas, plant of the Quaker Oats Co. worked 260,000 man-hours without a lost time accident. This achievement merited a National Safety Council award which is being presented. Safety scoreboard in the background has an unusual feature. Red light indicates a lost time injury. Color is switched to green when man returns. (From The Quaker, published by the Quaker Oats Co., Chicago)

Care of Cooling Tower Lumber

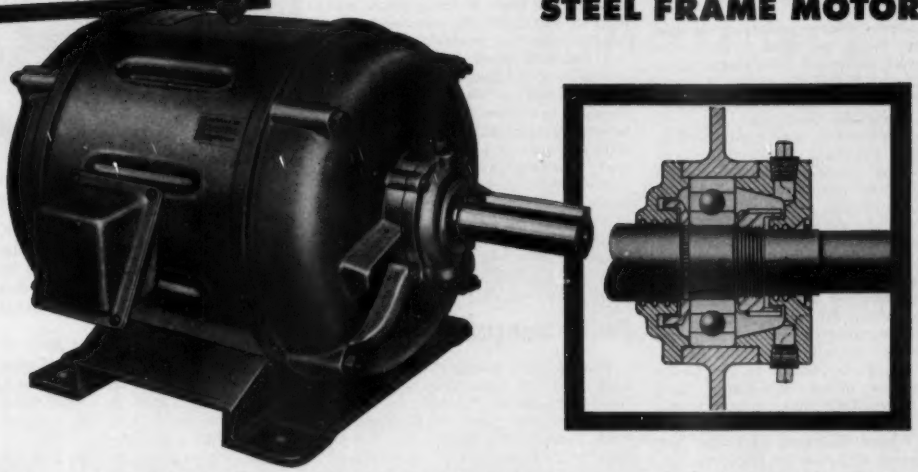
THE DESTRUCTION of cooling tower lumber, especially redwood, has, in general, two causes which are called arbitrarily chemical attack and biological decay.

Chemical attack can be explained from a consideration of the basic chemistry of wood and various components of the water which is circulated in cooling towers. Biological decay is caused by various microorganisms, predominantly of the fungus family. There are some indications that bacterial growth may contribute to this phenomenon. Considerable investigation on both chemical attack and fungus decay has been conducted, and results have been published.

Work of Technical Subcommittee 3 of the Cooling Tower Institute, with the cooperation of the California Redwood Association, has resulted in establishing recommended practices in the operation of cooling towers. It should be emphasized

Wagner
ELECTRIC MOTORS
...the choice of leaders in industry

Wagner
STEEL FRAME MOTORS



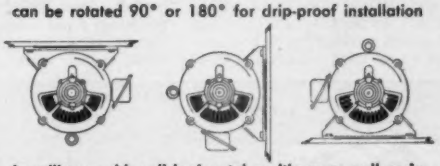
This sealed-bearing motor can be lubricated

Wagner Steel-Frame general purpose polyphase motors are equipped with labyrinth sealed bearing housings that effectively prevent the entrance of any dirt or grit that might cause premature wear. It is not necessary to lubricate the bearings—motors in the smaller frame sizes operate for years without relubrication. But... these Wagner Motors are provided with two lubrication openings — you *can* lubricate your motors when necessary or desirable, to add years of useful motor life in unusually severe applications.

Wagner's Bulletin MU-131 gives valuable information concerning proper lubrication of electric motors — Copies will be sent you on request.

DRIP-PROOF... 3 WAYS

These open-type motors (in frames 326 and smaller) are completely drip-proof in any horizontal position because there are no openings in the frame and the end-plates can be rotated 90° or 180° for drip-proof installation



in ceiling or sidewall horizontal positions, as well as in the normal horizontal position.

Wagner Steel-Frame Motors are available in electrical types to meet most industrial requirements. Bulletin MU-185 gives full information—write for your copy.

WAGNER ELECTRIC CORPORATION
6492 Plymouth Ave., St. Louis 14, Mo., U.S.A.

Wagner Electric Corporation EST. 1891

ELECTRIC MOTORS • TRANSFORMERS • INDUSTRIAL BRAKES
AUTOMOTIVE BRAKE SYSTEMS – AIR AND HYDRAULIC

BRANCHES IN 32 PRINCIPAL CITIES

A52-17

PLANT ENGINEERS' DIGEST

(Digest begins on page 28)

that these recommendations should not be taken as rigid rules to be followed under all conditions. Certain installations are of such a nature that existing operating practices cannot be changed.

The following general recommended practices for maintenance of cooling towers are presented in the light of the best knowledge at the date of this report: 1. For the control of delignification, (wood tissue break-down), and, possibly to some extent, fungal infection, cooling tower water should be kept at a pH between 6.5 and 7.5. These limits should eliminate constituents in most waters which lead to delignification. Suitable corrosion inhibitors should be added to the water to protect metal equipment used with the cooling tower in accordance with accepted practices.

2. Where halogen algicides are employed, chlorine or bromine, residuals in the water should not be allowed to exceed 1 to 2 ppm, in order to avoid the oxidizing effect of excess halogen on tower lumber.

3. In most cooling towers some algicide should be used for the proper protection of metal, cooling equipment and the towers.

4. Fungus infected lumber when discovered should be removed immediately from the tower and replaced with new lumber. It is anticipated that investigations will lead to a satisfactory solution to the fungus infection problem.

5. General good housekeeping is essential to the proper operation and maintenance of cooling towers. Proper maintenance of cooling towers should include regular periodic inspections, at which time scale and encrusted salt should be removed, water boxes, basins, and screens should be thoroughly cleaned and all debris and fragmentary material should be removed. *From a progress report published by the Cooling Tower Institute, Basking Ridge, N. J.*

Flexible Underground Conduit

PLASTIC PIPE is being used for the first time as underground conduit for power lines. Kingsport Utilities is testing the pipe in cooperation with Tennessee Eastman Co. Tenite pipe in 20 ft lengths is used instead of the regular 5 ft conduit sections made from other material.

The operator of the mechanical ditch digger had only to scoop up clay and shale rock for the trenches. Because of the flexibility of the pipe, the trenches did not have to be the exact straight-edge sides and base required for the usual rigid type of conduit.

Flexibility and lightness of plastic pipe permit the men to work standing up

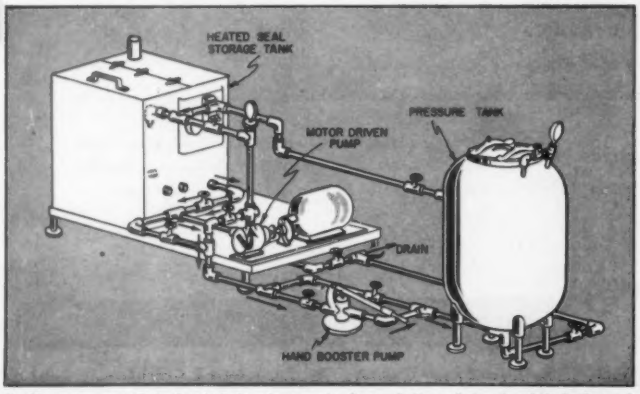
It took a two-man crew only 20 min to lay 247 of the 1,100 ft of pipe used in the project. By comparison, it is estimated that it would have taken 4 hr work had the regular rigid conduit been used.

Joining was a speedy job, too. All that was necessary was to brush on some thinner to soften the section ends, follow with a special cement and slip together. After drying

Impregnating System Keeps Porous Castings from the Scrap Pile

CASTINGS rejected, because of their inability to withstand liquid or gas pressure, can be reclaimed by an impregnating system. The Tincher process for sealing these rejects has been developed over the years and today major industries are using it. From this impregnating system great savings in labor and material have been realized. Quality of product has been maintained and even quality of the finished product has been improved.

The process is a threefold balance of chemical compound, equipment and know-how. The sealing compound, once properly delivered, produces a permanent air and water tight part or casting. The equipment must deliver that compound effectively and economically through the porous voids in the casting.



Sealing compound is heated in storage tank on left and is circulated through the pressure tank by motor driven pump. Hand pump builds up high pressures

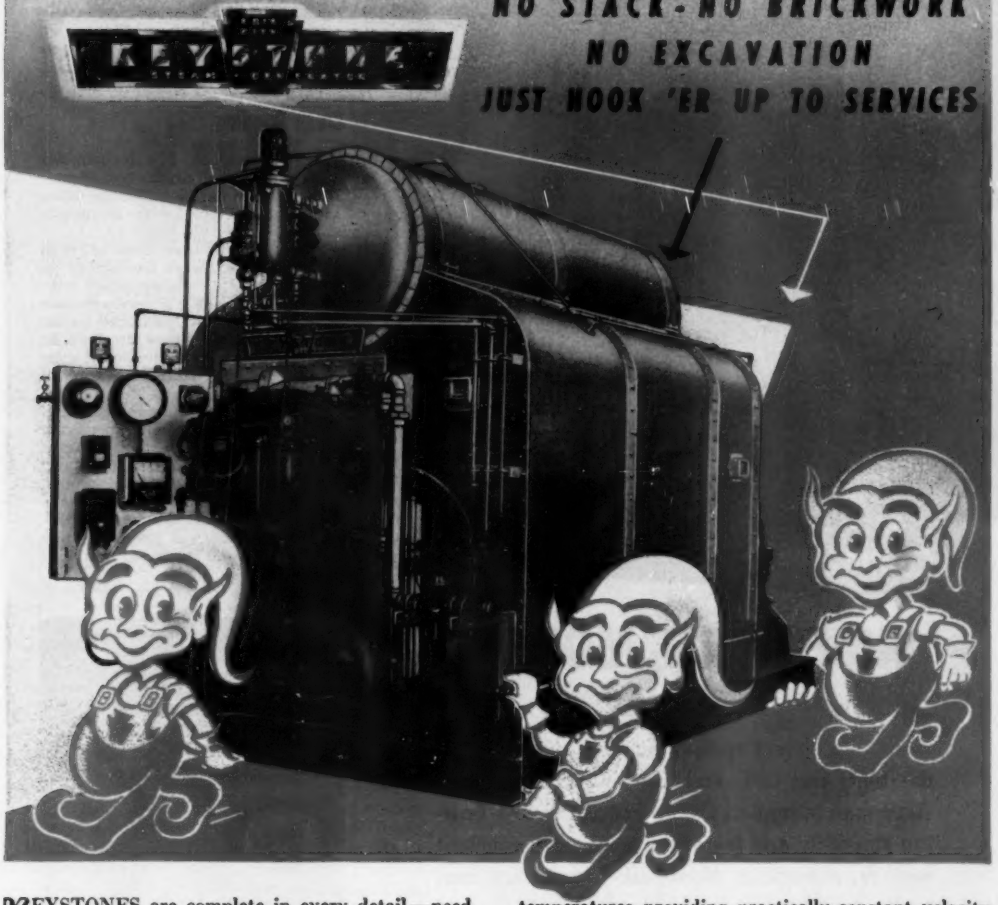
For sealing small parts like valves and plumbing fixtures, the operation involves a pressure tank and goes something like this: The seal is heated in a storage tank to a temperature of about 180 deg. The parts are placed in the pressure tank, usually in wire baskets, and the tank head is then secured.

The sealing compound is circulated throughout the tank until the castings reach a temperature of about 180 deg. Then the pressure tank is filled until the seal runs out of the open valve at the top. After this valve is closed, pressure is applied between 200 and 400 lb with a hand booster pump. This pressure is held for about 15 min and is then released. Finally, there is the rinse with cold water to remove the excess seal from the surface of the parts.

Practically any metal part that must retain high liquid or gas pressures may be effectively sealed by this process. For instance: engine blocks, engine heads, all types of valves, air pumps, air cylinders, liquid pumps and others. *From Fairbanks-Morse News, published by Fairbanks-Morse Company, Chicago, Illinois.*

Move in STEAM *to order*

NO STACK - NO BRICKWORK
NO EXCAVATION
JUST HOOK 'ER UP TO SERVICES



KEYSTONES are complete in every detail—need only to be connected to services. Keystones are compact, 2-drum *water tube* boilers designed for high capacity operations in a wide range of operating pressures. They are conservatively rated (5 square feet of heating surface per developed h.p.)

They feature cyclonic center firing with oil or gas or both. Gases travel 3 complete lengths of the boiler and gas areas are carefully proportioned to decreasing temperatures providing practically constant velocity and assure *no pockets where unburned gases can accumulate.* All boiler surfaces exposed to heat transfer are completely submerged below water line.

You can install a Keystone indoors or outdoors close to steam application. It's fully automatic and requires only part time operator. Booklet SB-38U is available.

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112 Years in Steam Generation

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STEAM GENERATORS • SUPERHEATERS • ECONOMIZERS • AIR PREHEATERS
UNDERFEED AND SPREADER STOKERS • PULVERIZERS

with **AMERICAN MONORAIL**

Here's an operation that must be on the go, all the time and fast, and yet, one man plus an American MonoRail Crane keeps the line flowing smoothly and fast. Fast operating, constant service, American MonoRail Cranes are ruggedly built to handle loads up to 10 tons at operating speeds of 500 feet per minute. Articulated trolleys assure perfect alignment of trucks for smooth crane travel.

Let an American MonoRail engineer explain all the advantages of these constant service cranes.

THE AMERICAN MONORAIL COMPANY

13123 ATHENS AVENUE ● CLEVELAND 7, OHIO

PLANT ENGINEERS' DIGEST

(Digest begins on page 28)

for 30 min, the joint was as strong as the pipe itself. *From The Illuminator, published by Appalachian Electric Power Company, Roanoke, Virginia.*

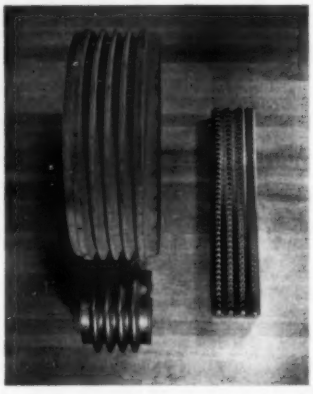
Crush Grinding

APPLICATION of crush grinding techniques to the production of surface broaches permits quantity manufacture of extremely accurate tools for intricate shapes.

A major advantage of using crush grinding methods is the ability to produce quantities of broaches with identical accuracy, for once a master form tool has been produced to the required accuracy, this form can be faithfully reproduced over and over again on the cutting surfaces of quantities of broaches.

Military and peacetime product designers are continually specifying more and more intricate shapes that can economically be produced only by the broaching process. Crush grinding techniques have enabled broach manufacturers to produce tools that will produce these intricate shapes with an amazing degree of accuracy.

A 0.003-in. radius can be easily



Cast iron crushing roll machined with master form tool appears below the crush formed wheel. Broach segment has been produced by crush grinding

produced on a grinding wheel by crushing techniques.

Many intricate shapes specified by designers today are extremely small in size and require small diameter grinding wheels to back off broach cutting surfaces. A wheel as small as ⅜-in. dia. can be formed by crushing methods for this need.

Surface broaches produced by

See for Yourself WHY

Gates Vulco Ropes Wear Longer

Make this Simple Test

Take any V-belt that has *straight* sides. Bend that V-belt while you grip its sides between your fingers and your thumb. You will *feel* the sides of the belt *bulge out*—as shown in figure 1-A, below.

Clearly, that outbulge forces the sides of the belt to press *unevenly* against the V-pulley—and this concentrates the *wear* where the bulge is greatest.

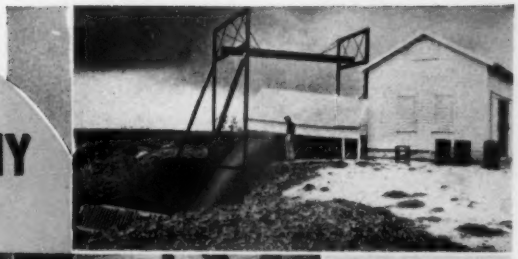
Now, make the same test with the belt that is built with the Concave Sides—the Gates Vulco Rope.

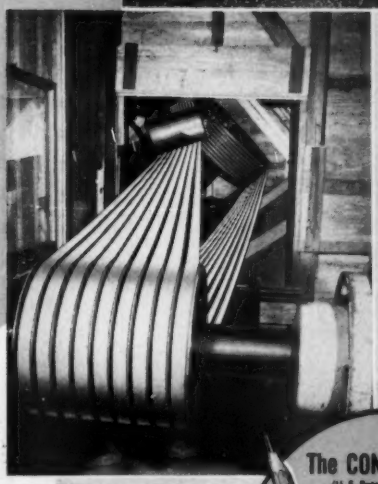
Figures 2 and 2-A show clearly what happens when you bend a Vulco Rope. Instead of *bulging*, the precisely engineered Concave Sides merely *fill out* and become perfectly straight. This belt, when bent, precisely fits its sheave groove.

Because there is *no bulging*, the sides of the Gates Vulco Rope always grip the full face of the V-pulley *evenly* and therefore wear *uniformly*—resulting in *longer belt life* and *lower belt costs for you.*

When you buy V-belts, be sure to get the V-belt with the Concave Sides--the Gates Vulco Rope!

Gates Engineering Offices and Jobber Stocks are located in all industrial centers of the United States and in 71 foreign countries.

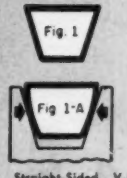




This big 80,000 GPM turbine pump lifts water against a 14 foot head from a drainage canal to Lake Hicpochee in the Diston Island Drainage District near Moore Haven, Fla. Driven by a diesel engine through a 9 D-Section Gates Vulco Rope Drive with a one-eighth turn, the pump drains 19,000 acres of land for sugar cane and cattle raising.

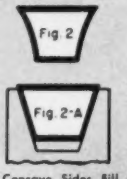
What Happens When a V-Belt Bends

Straight-Sided V-Belt



How Straight-Sided V-Belt Bulges in Sheave-Groove. Sides Press Unevenly Against V-Pulley Causing Extra Wear At Point Shown by Arrows.

Gates Vulco Rope with Concave Sides



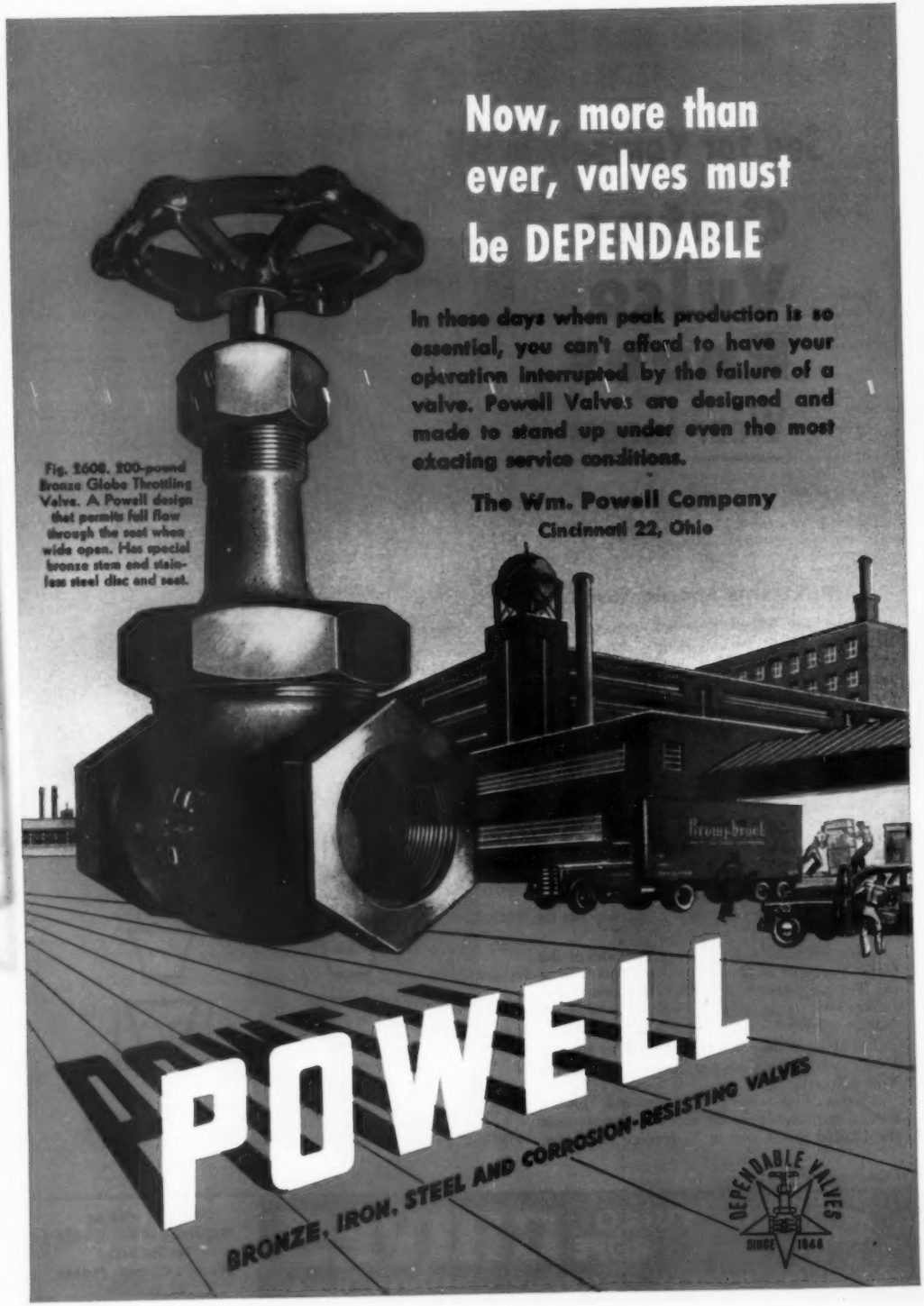
The Concave Sides Fill Out to a Precise Fit in the Sheave-Groove. No Side Bulge! Sides Press Evenly Against the V-Pulley — Uniform Wear — Longer Life!

CS-528-A

Gates VULCO ROPE DRIVES

THE GATES RUBBER COMPANY • DENVER, U.S.A.

V-Belts — Hose
Molded Rubber Goods
for industry
World's Largest Maker of V-Belts


Now, more than ever, valves must be DEPENDABLE
In these days when peak production is so essential, you can't afford to have your operation interrupted by the failure of a valve. Powell Valves are designed and made to stand up under even the most exacting service conditions.
The Wm. Powell Company
Cincinnati 22, Ohio
Fig. 2608. 200-pound Bronze Globe Throttling Valve. A Powell design that permits full flow through the seat when wide open. Has special bronze stem and stainless steel disc and seat.
POWELL
BRONZE, IRON, STEEL AND CORROSION-RESISTING VALVES
DEPENDABLE VALVES
SINCE 1846

BULLETINS just released and of immediate plant interest

CONSTRUCTION AND MAINTENANCE

101 Industrial Steel Windows—Planned to offer comprehensive easy-to-find data, this 24-pp catalog gives descriptions, specifications, sizes, uses and advantages of Fenestra pivoted windows, commercial projected windows, and security windows used separately and in combination, also continuous windows used mainly for top-lighting in monitor and sawtooth roof construction. Construction features, hardware, section drawings and installation details in various types of construction are covered. Detroit Steel Products Co.

102 How to Glaze with Plexiglas—Sixteen-pp Booklet PL-23 gives detailed information on glazing industrial and other buildings with flat panels of the acrylic plastic Plexiglas. Written for plant engineers concerned with frequent breakage of windows or other glazing problems. Gives properties and behavior of this plastic sheet and detailed data on installation methods and ways of cleaning. Twelve drawings show how to install the shatter-resistant plastic in wood and metal sash. Plastics Dept., Rohm & Haas Co.

103 For Curtain Walls—Form 1168 is a 12-pp booklet describing Armorply building panels for curtain wall construction. Contains suggested design details and specifications. These panels are of sandwich construction, comprised of a core and two metal faces. Information on cores available, sizes of panels, heat insulation characteristics, fire resistance included. United States Plywood Corp.

104 Steel Utility Buildings — All-steel buildings for industrial and other uses are described and illustrated in 8-pp Bulletin 1. Pictures styles and applications of the prefabricated structures and steps in erection. Includes a section on design features, specifications, details of company's clip-and-wedge assembly, and drawings of six standard wall panels, also information on how to plan your own building. United Steel Fabricators, Inc.

105 On Air-Entrained Concrete — This folder describing the advantages of using Vinsol, air-entraining agent in concrete, lists briefly the advantages of air-entrained concrete and methods used in its production. Use of neutralized Vinsol solution is covered in a series of questions and answers. Hercules Powder Co.

106 Specialized Water Repellent—Technical Data Guide 44 presents Hydrocide S.X 2210, an aqueous resin solution of silicone resin compounds specifically designed for masonry surfaces containing a high lime content. Tells advantages for use on all exterior limestone or asbestos cement surfaces, gives directions for use, coverage. L. Sonneborn Sons, Inc.

107 Case Histories on Fastener — Case histories and latest engineering data on manufacturer's Rollpin self-locking fastener are featured in 16-pp Catalog 900. Photos show versatility of the device as a practical substitute for rivets, cotter pins, set screws and other fasteners. New data developed by company's research department specifies (in charts and tables) insertion and removal forces in steel for various Rollpin diameters and lengths, and how these forces are affected by material hardness. Mastic Stop Nut Corp.

MATERIALS HANDLING

108 Lifting and Stacking Trucks—Colorful new 18-pp Catalog 34 describes two units of company's Master line of industrial trucks—the Jacklift Electric and the Master Jackstacker. Gives engineering and operating features of the various models which are designed to provide more power, shorter headroom, better controls. Fully illustrated, catalog explains maintenance features, includes specifications. Lewis-Shepard Products, Inc.

109 To Simplify Loading Jobs—Bulletin 50 describes and pictures a conveyor for truck and box-car loading of bagged materials. Shows how it is designed to reduce manual labor and speed up loading. Includes plans and specifications. Power-Curve Conveyor Co.

110 Tramrail Possibilities — Illustrated with installation photos and layouts, this bulletin shows the many handling combinations possible with company's Ohio tramrail systems. Pictures a newly developed hot metal handling system used in a foundry to move metal from the cupola to pouring floors. The Forker Corp.

111 Conveyor Belting—In a thorough analysis of company's B-G belt, this 8-pp bulletin shows how its construction is designed to defeat the major causes of belt failure, such as ply separation, carcass deterioration, irregular plies, edge wear and others. Selection tables are provided. Barber-Greene Co.

STORAGE EQUIPMENT

112 Storage Racks—Twelve-pp Bulletin 5221 presents steel storage racks for drums, barrels, crates, bins, skids and pallets and is generously illustrated with installation views. Shows how engineered storage rack systems solve problem of more storage space without cost of new buildings, by multiplying storage capacity of floor space up to the ceiling. Barrett-Cravens Co.

113 Shelf Storage—"The Science of Economical Shelf Storage" is a 16-pp booklet discussing company's Rotabin rotary shelving to store parts, tools and materials more efficiently in tool or supply room. Outstanding design and construction features of this shelving are shown, also accessories available, and bulk storage and special types of Rotabins. The Frick-Gallagher Mfg. Co.

INSTRUMENTS, CONTROLS

114 Seven Industrial Eyes—Seven types of x-ray equipment for the internal examination of plant problems are pictured and described in Bulletin B-4787. Units covered are a single-column tubestand unit, mobile unit, equipment for mass inspection of parts, wall unit and thickness gage. Westinghouse Electric Corp.

115 Production Recorder—This bulletin describes a new instrument for industrial machines which indicates both potential and actual production, machine speed and number and duration of stops. Tells what machine can accomplish and how it does it. Knopf Instrument Co.

116 Rotating Regulators for Steel—This revised 22-pp applications booklet, B-3098-B, presents up-to-date information on manufacturer's Rototrol rotating regulators for the steel industry. Tells applications, functions and accomplishments of this small d-c generator as a control for steel producing and processing equipment. Fourteen mill applications are described with circuit diagrams, photos and sketches. Use of Rototrols as speed regulators for skip hoist drives, as tension controllers for winding operations and as power regulators for arc furnaces are typical. Operating principle of Rototrol is explained. Westinghouse Electric Corp.

117 Bin Level Indicator—The Bin-Vue, a simply designed level indicator for any dry bulk flowable material, is pictured and described as to operation and advantages in this bulletin. Includes dimensions, prices. Convair.

118 Oil Burner Controls Handbook—This 48-pp pocket size booklet is generously illustrated and provides excellent information on the use of oil burner controls. Provides control wiring diagrams, installation instructions and service hints. Some 28 types of company's controls are presented in detail and there are comparison charts covering manufacturer's own and competitive controls. The Mercoid Corp.

119 Meet Microwave—"An Introduction to Microwave," 20 pp, provides a semi-technical description of RCA microwave equipment and is illustrated with photos, charts, diagrams etc. Describes microwave radio, tells how it works, gives propagation characteristics, operation advantages, economic factors influencing choice of frequencies, and desirable design characteristics. Also deals with multiplexing, telemetering and remote control; tells who can use microwave, how to plan a system. Microwave Communications Section, Radio Corp. of America.

ELECTRICAL, LIGHTING

120 Silicone Electrical Insulation—Although original AIEE specifications for Class H insulation referred to a rather confined group of components, subsequent development has produced a wide range of materials and combinations and a consequent variety of Class H insulations, each suited to a different purpose. Illustrated Form G-26 presents a list of recommended Class H components. Properties, specifica-

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October, 1952

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PLANT ENGINEERING

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tions, uses and availability are given for each. Features of Class H insulation are described briefly, representative applications mentioned. Folder contains information of interest to any plant engineer concerned with economical performance of electric motors under difficult operating conditions. Dow Corning Corp.

122 **Breaker Test Data**—Bulletin 71E7856, "How Much Can a Breaker Take?" is an 8-pp article describing results of recent field tests conducted on a standard 69-kv, 1500-mva oil circuit breaker. Allis-Chalmers Mfg. Co.

123 **Miniature Circuit Breaker**—Mini-form 101 introduces a circuit breaker that fits like a fuse in any standard plug-type fuse receptacle. Explains how Mini-Breaker gives protection against overloads and shorts for industrial and other buildings, also electrically operated machines and appliances. A keyed cutaway illustration shows how the breaker is designed, how it works. Mechanical Products, Inc.

124 **Renewable Fuses**—Stressing dependable time delay, immediate restoration of circuits, flexibility in installation and expansion, and other advantages of manufacturer's fuses, 16-pp Form S-40 presents application and ordering data on ferrule-type and knife-blade type fuses and renewal links. Text explains operation of the renewal links, automatic alignment incorporated in the knife-blade fuses. Economy Fuse & Mfg. Co.

125 **Switches for Outdoor Use**—Bulletin 3207 describes manufacturer's line of H-2P high capacity switches for outdoor service and is illustrated with photos, diagrammatic drawings and tables. Heavy duty switches described utilize high pressure contacts at clip and hinge ends without use of threads or complicated clamping devices. Delta-Star Electric Co.

126 **Duct with Aluminum Bars**—Bulletin B-750 presents manufacturer's Bustribution duct with aluminum bus bars, stressing the features of aluminum as an electrical conductor. Also contains the story of how aluminum has been adapted to electrical uses. A chart comparing relative size, weight and performance of aluminum and copper in company's LO-X and Plug-In duct is also featured. BullDog Electric Products Co.

The post card below needs no postage. Use it to order bulletins by listing item numbers of all those wanted. Two other cards are provided for you on page 165.

127 **Snap Action Switches**—Catalog SE. 24 pp, on precision snap-action switches, presents safety, limit, and interlock types designed especially for switching a-c circuits in industrial applications. Covers heavy-duty limit switches, metal enclosed switches, some of which are sealed against dirt, dust, splashing of oil or water. Also included are explosion-proof, and splash-proof switches, auxiliary brackets, actuators, standard size basic switches and ultra small designs. Provides dimensions, mechanical characteristics, electrical characteristics and capacities, as well as technical data and application ideas. Micro, Div., Minneapolis-Honeywell Regulator Co.

128 **Interlocking Wiring Devices**—This 8-pp folder on operation and advantages of company's new interlocking wiring devices shows how the units are designed to eliminate accidental disconnects, how a twist locks the connector and a reverse twist unlocks it. Recent improvements in construction are shown, including a new one-piece contact design and optional back-wiring for easy installation. The Arrow-Hart & Hegeman Electric Co.

129 **Lighting for Industry**—All types of lighting applications experienced in industry are treated in this 96-pp, illustrated booklet. Opens with a section covering economics of industrial lighting, lighting calculations, lamps, illumination values and an economic analysis of the incandescent-mercury and fluorescent systems. A section on interior areas treats high and low bay lighting, mills, foundries, spray booths, controlled boards, switchboards, turbine rooms, boiler plants, drafting room, laboratories, other areas. The section on outdoor lighting covers yards, roadways, gates and doors, parking lots, platforms, docks. Holophane Co., Inc.

PUMPS, COMPRESSORS

130 **For Those Abrasive Pumping Jobs**—This new 36-pp edition of company's general catalog covers complete line and introduces new Type TW, a horizontal shaft, single stage side suction pump, and Type AW, automatic priming pump. Stressing use of company's pumps for abrasive or corrosive pumping, text explains how choice of impeller designs available permits greater efficiency according to operating conditions encountered. Tells what jobs these pumps are suited to handle in more than a dozen types of industries. Discusses impeller designs, gives priming data, specifications, capacities. Photos and dimension drawings illustrate text. Nagle Pumps, Inc.

131 **Wet Pit Pumps**—Bulletin 3-9000, 24 pp, covers two similar but functionally different types of vertical centrifugal wet-pit pumps. One of these is a heavy duty bilge pump for handling solids-free liquids and drainage; the other is a screenless sewage ejector, constructed to handle sewage and solids-carrying liquid. Booklet also introduces a new lubricating system designed to provide continuous positive lubrication of the pump bearing, to greatly reduce bearing failure and increase pump life. Yeomans Brothers Co.

132 **High Pressure Pumps**—Plant engineers with high pressure pumping problems will find in 6-pp Bulletin 50-295 dimensions, capacities, cutaway drawings on pumps from 600 to 5000 psi or 1.1 to 16.5 gpm. Direct drive and back-geared models are described for such uses as high pressure testing or back washing of pipes, valves, vessels, boilers—for high pressure boiler feeding, bending, straightening, shaping, forming, pressure molding operations. American-Marsh Pumps, Inc.

133 **FHP Air Compressors**—Manufacturer's Monobloc air compressors capable of 2.6 to 5.0 cfm and up to 150 psi pressure are the subject of Specification Sheet H-905-B2. Discusses valves, cylinder head crankcase and other components of these compressors which are designed for pressure spraying, dry pipe sprinkler systems, pressure lubrication and general small capacity use. Worthington Corp.

HEATERS, HEATING

134 **Indirect Heaters**—Primarily designed to help in the selection of the most efficient heater for job requirements, 36-pp Catalog C-101 gives a complete description of company's "70" series and Junior indirect heaters, their uses, advantages, construction, capacities and specifications, dimensional drawings and standard equipment furnished with each model. Describes such important accessories as extra long chokes and fuel gas regulators. Shows how to select right size heater and flow coil for both gas and oil heating problems. Black, Sivalls & Bryson, Inc.

135 **Heat-on-Wheels for Industry**—Illustrated Form 3574, 16 pp, is the story of how manufacturer's portable heaters can solve emergency heating problems. Shows how these heaters provide extra heat for the hard-to-heat spots, and for extra cold areas, to spot heat where needed, and for ventilating, drying and thawing jobs. Filled with photos of these heaters at work indoors and outdoors, also shows their use with flexible ducts. Herman Nelson Div., American Air Filter Co., Inc.

136 **Put Up to Stay Up**—Stressing company's advertising theme this illustrated bulletin tells of some 15 installations of Grid heaters put in operation as far back as 1929 when they were first marketed. Includes capacity data on the heaters, brief description of its features. D. J. Murray Mfg. Co.

137 **Unit Heaters**—Catalog NGC-10-52, 8 pp, features a full-color cutaway illustration of a Thermobloc direct-fired heating unit. Various models manufactured by company are illustrated by photos and drawings. Specifications and dimensions given. Thermobloc Div., Pratt-Daniel Corp.

AIR CONDITIONING, COOLING, DUST CONTROL

138 **Mechanical Draft Cooling Towers**—Eight-pp Bulletin 47-A features cooling towers of the single and double inlet squirrel cage blower type, and also provides data on towers of the horizontal induced draft fan type. Sections dealing with the squirrel cage blower type contain charts showing typical temperature performance data, specifications, cutaway blue print drawings and a selection table for air conditioning and related applications. Water Cooling Div., Binks Mfg. Co.

139 **Packaged Air Conditioners**—Specification Sheet C-1100-S21 describes two packaged air conditioning systems, one of 10-ton and the other of 15.5-ton capacity. Tells features, includes specifications for the systems which are designed for cooling, dehumidification, ventilation, circulation, cleaning, etc. Worthington Corp.

(Continued on page 168)

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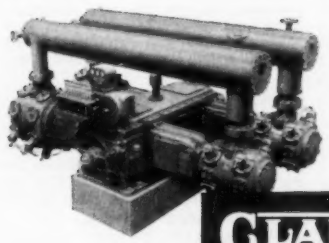
In air compressors, perfect balance is of *prime* importance. It means vibration-free performance.

Clark Balanced/Opposed, Motor-Driven Compressors are the *first* heavy duty air compressors to incorporate perfect balance, therefore the first to assure you of *all* these advantages in the 150—4500 horsepower range:

- Installation anywhere—on upper floors, steel framework, alongside delicate machines.
- Substantially reduced foundation requirements.
- Extra long compressor life, with a minimum of maintenance.
- No vibration or noise to be transmitted within the plant or to nearby buildings.

For complete information on the truly modern Clark Balanced/Opposed Compressor line, request Bulletin 118.



CLARK BROS. CO. • OLEAN, N. Y
DIVISION OF DRESSER OPERATIONS, INC.
Sales Offices in Principal Cities Throughout the World

CLARK balanced/opposed compressors
PRECISION BY THE TON

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You can avoid layoffs, speed work in cold areas, protect perishable goods in a warehouse or provide supplementary heat for those extra cold days with safe, economical Herman Nelson Portable Heaters. Heat on wheels may enable you to continue operations during emergencies created by power failures or a breakdown of your regular heating system.

The only completely safe Portable Heater that uses flexible ducts to spot heat where most needed—and remember, only uncontaminated air heaters are absolutely safe!

Herman Nelson Portable Heaters are available in three models. Cost as little as $360. Easily moved and operated by one man.

HERMAN NELSON DELUXE I
Capacity 280,000-450,000 BTU/hr. Completely automatic, including temperature control. Fresh air delivery 2,000-2,350 cfm. Oil fired, electric powered. Other models available—with gasoline or electric power—and capacities from 125,000 to 385,000 BTU/hr.

Find out how to put portable heat to work for *you*. Mail this coupon today.

Herman Nelson Division, Dept. 82
American Air Filter Company, Inc., Moline, Illinois

Gentlemen: Please send information about Herman Nelson Portable Heaters; also my free copy of HEAT-ON-WHEELS FOR INDUSTRY.

Name_____

Title_____

Company_____

Address_____

City_____ State_____

PLANT ENGINEERS' DIGEST

(Digest begins on page 28)

crush grinding methods are smooth and have an excellent finish. The grinding wheel abrasive surface as crushed is 'sharp' and hard, which explains why smooth high finish surfaces are produced. Smooth surfaces on broaches improve performance and increase tool life.

Another reason that surfaces produced by crush formed wheels are smooth is that fine grit wheels can be shaped.

In general, crush grinding techniques have aided materially in speeding delivery of quantities of close tolerance surface broaches with intricate shapes. *From a release for Colonial Broach Co., Detroit, Michigan.*

Radio Controlled Crane

An English firm came up with an overhead traveling crane that is operated from a portable radio transmitter. The operator carrying the radio equipment is in position to spot a lift with accuracy. (From British Information Services, 30 Rockefeller Plaza, New York)

Fly-Ash Control

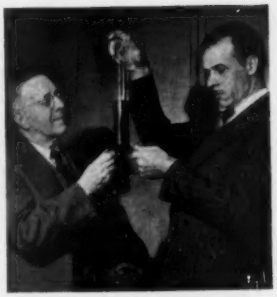
A GREAT DEAL of progress has been made by the Detroit Edison Co. in its fight to control fly-ash during the past few years. In this the Cottrell Electrical Precipitator has proved itself an effective weapon.

Electrical precipitators are installed on the 4 high pressure boilers in the new extension at Conners Creek power plant. These boilers use pulverized fuel and one of the

A century of achievement

Studebaker's big, modern South Bend plant symbolizes the century of growth and achievement which have earned for this company an enviable reputation for high quality products and world-wide recognition as America's fourth largest manufacturer of automobiles.

What's YOUR problem?



Russ Jenkins (left), lubrication specialist from Standard's South Bend office, and Studebaker's Paul Izdepski work closely together to get best results from Standard's fuels and lubricants.

Wherever your plant is situated in the Midwest, there is a Standard lubrication specialist close-at-hand who will work hand-in-hand with you on lubrication problems. Right in your neighborhood, too, you'll find a Standard office and warehouse. It makes immediately available to you a reliable supply of petroleum products. Phone your local Standard office soon, and find how you can profit through Standard's unique industrial lubrication service.

How Standard's lubrication service works for Studebaker

● Look almost anywhere in Studebaker's vast plant at South Bend, Indiana, and you'll see Standard's lubrication service at work.

In one of the many operating departments, the chances are you'll find the Standard lubrication specialist who serves Studebaker. He is assigned to the South Bend area and is close-at-hand to give Studebaker the lubrication engineering assistance they need when they need it.

Almost any day at Studebaker's, you'll see a Standard tank wagon or truck delivering the petroleum products that help keep production rolling. Because these deliveries are made from a nearby Standard warehouse, they are prompt and reliable. Most of the petroleum products used in the Studebaker plant are stocked in this warehouse and are immediately available.

All along Studebaker's assembly and production lines, you'll find Standard Oil products at work. From one of the most complete lines of fuels and lubricants on the market, Studebaker has been able to select the petroleum products that exactly fit its needs.

All of these benefits—expert engineering service, fast and reliable deliveries, a complete line of high quality products—add up to one of the reasons why Studebaker has been a Standard Oil customer for over 50 years. Make Studebaker's experience the basis for putting Standard's lubrication service to work for you. Just phone your local Standard Oil (Ind.) office and ask to have the Standard Oil lubrication specialist in your area call on you.

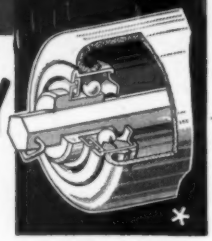
STANOBAR Grease is used throughout the Studebaker plant for lubrication of bearings in electric motors and oil pumps. Its high stability enables it to provide effective lubrication under a wide variety of operating conditions.

STANWAY Industrial Oil. In many of Studebaker's grinding machines, STANWAY Industrial Oil No. 30H answers a special need by serving both as a hydraulic oil and as a lubricant for ways and guides. The high stability necessary in a hydraulic oil and the oiliness needed in a way lubricant are uniquely combined in STANWAY.

STANDARD OIL COMPANY STANDARD (*Indiana*)

Buschman CONVEYORS

CUT ASSEMBLY COSTS 50%



for automotive transmission builder

More than a year's use shows that a Buschman Roller Conveyor has cut approximately 50% in assembly costs for a noted transmission manufacturer. "Highly satisfied with the installation," the user reports that the conveyor is particularly flexible, permiting time-saving straight line assembly never possible before in this operation.

There's a Buschman Conveyor to move practically any part or product faster, easier and at lower cost. Find out why users in every industry say Buschman Conveyors are "Better Built . . . A Better Buy." Write for literature: Catalog 60—Roller Conveyors or Catalog 400—Complete Conveyor Line.

*Dustproof labyrinth-sealed bearing, the heart of the roller, grease-packed for life. Ideal for heavy duty operation. Free running dustproof labyrinth-sealed bearings of similar design recommended for gravity roller conveyors. There is a type to suit every requirement.

Representatives in principal cities
Canadian Licensee: James A. McKechnie, Ltd., Toronto 12, Canada

PRODUCE MORE . . . FOR LESS on Buschman Conveyors

THE E. W. BUSCHMAN COMPANY
4426 Clifton Avenue
Cincinnati 32, Ohio

PLANT ENGINEERS' DIGEST

(Digest begins on page 28)

difficulties associated with the use of this fuel is the fly-ash problem. Precipitators trap the fine dust that would ordinarily be discharged into the atmosphere and create a nuisance.

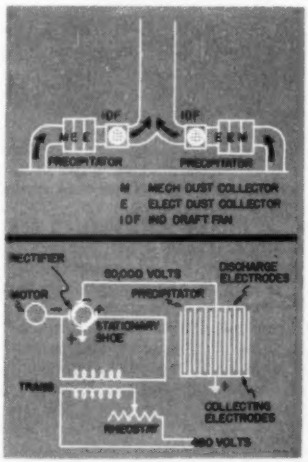
As shown in figure, the flue gas first passes through a mechanical dust collector which takes out more than 50 per cent of the total ash particles. Then, the gas passes through an electric precipitator for further cleaning.

An electric precipitator consists essentially of a number of high-voltage discharge electrodes located centrally between collecting electrodes. The latter have a large surface and are often called "collecting curtains."

A 480 v, a-c power supply energizes a transformer which steps up the voltage for the precipitator. The emf is stepped up to somewhere between 40,000 and 75,000 v, depending upon the primary transformer taps in use and the adjustments on the variable rheostat in the primary.

The high voltage alternating current is rectified to direct current by means of a rectifier. The rectifier is a rotating bakelite disc with arcing tips and 4 stationary shoes. The top shoe is connected to the discharge electrodes of the precipitator, the bottom shoe and to the ground. The other two shoes are connected to the terminals of the transformer.

In operation the discharge elec-



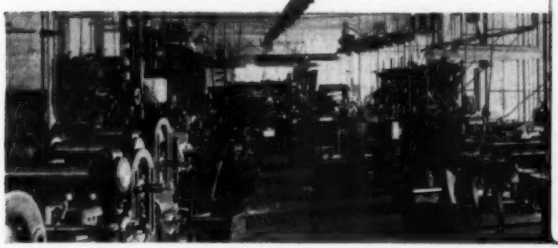
Top figure shows path of flue gas from each of two boilers to a common stack. Below is a hook-up of the mechanical rectifier and electrical equipment in use

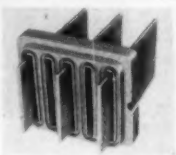
for more efficient, economical power distribution

FA POWERPLUGIN

For safe, efficient, flexible, economical and dependable power distribution for machines and lights in industrial plants, FA POWERPLUGIN Busduct is unsurpassed.

- Made in standard 10-foot lengths with a plugin outlet every foot of the way in one side, or alternately in two sides, FA POWERPLUGIN makes power available where and when it's needed.
- It enables machines to be relocated and regrouped without disrupting production, eliminates temporary connections and long leads, cuts maintenance costs and affords other big savings by reducing power loss and voltage drop to a minimum. Too, it's 100 percent salvageable.
- Underwriters' Laboratories' approved, FA POWERPLUGIN is available in capacities of 250 to 1000 amps, 600 volts AC or less with Klampswitchfuz, Shutlbrak or Circuit Breaker plugin units for 200 amps or less.
- If you want greater plant efficiency FA POWERPLUGIN is the answer. For further information contact your nearest FA representative, listed in Sweets or write for bulletins.





Features of FA POWERPLUGIN

FA POWERPLUGIN is made of 16-gauge steel with attractive gray enamel finish. It is only 7 inches wide, 4 inches deep for 600 amps and less and 6 inches deep for 800 and 1000 amps, permitting its use in restricted areas.

Insulators are one-piece glazed porcelain with steel channel supports riveted into position.

Sliding cover type plugin openings, simplified adjustable, two-screw type fasteners for plugin units, two sliding type mounting brackets per section for hanging as desired, electro-silver plated contact surfaces at joints with two or four brass jam bolts with phosphor bronze cup washers in elongated fastening holes are other features.

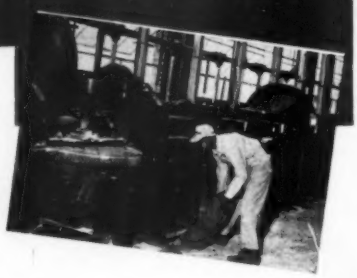
Frank Adam Electric Co.

P. O. BOX 357 ST. LOUIS 3, MISSOURI

Makers of BUSDUCT • PANELBOARDS • SWITCHBOARDS • SERVICE EQUIPMENT • SAFETY SWITCHES • LOAD CENTERS • QUIKHETER

FA TRADE MARK

Collecting dust
is profitable with DUSTUBE



At the National Lead Company in Los Angeles, a major dust problem was created in processing the finely ground, dry pigments that give Dutch Boy paints their vivid rainbow hues and lasting protection.

The clouds of fine dust caused by charging this material into the mixing machines represented a loss of valuable material, made working conditions unpleasant, and would create a public nuisance.

The Dustube Dust Collector was selected because of its top efficiency in trapping the finest dust particles, and its low cost of operation and maintenance . . . it has lived up to every expectation.

Cleanliness in the mixing room now makes quality control easier. No dust is discharged to the outside air. The men charge the mixers in comfort without respirators. The recovered pigments can be reused. Challenge American's engineers to solve your problem. An inquiry involves no obligation.

SEND FOR THE NEW DUSTUBE CATALOG —
Contains 40 pages of practical information and engineering data on dust and fume control. Write for Catalog 72-B.

American dustube COLLECTORS

OFFICES IN PRINCIPAL CITIES

AMERICAN WHEELABRATOR & EQUIPMENT CORP., 839 S. Byrkit St., Mishawaka, Ind.

PLANT ENGINEERS' DIGEST

(Digest begins on page 28)

trodes are negatively charged at a potential of about 50,000 v. The collecting electrodes with a positive charge are grounded. A strong electrostatic field is set up between them, the gas in the precipitator is ionized and the dust particles negatively charged. These dust particles are attracted to and deposited on the positive collecting electrodes.

The particles give up their charge after being deposited on the collecting electrodes. They cling lightly to the surface until the are removed by "rapping." The dislodged dust falls into the dust collecting hoppers located below the precipitator housing. From there it is transported into a silo by means of a conveyor and removed by truck or railroad car. *From an article by Bill Marsh in Coal to Kilowatts, published by Detroit Edison Co., Detroit, Mich.*

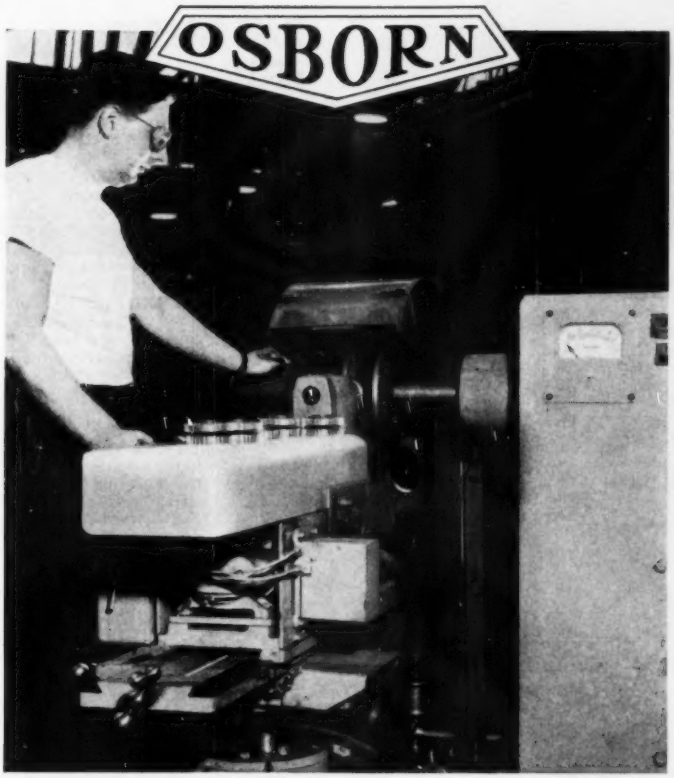
Work Simplification

WORK SIMPLIFICATION has been defined as "The organized use of common sense for finding easier and better ways for doing work." It operates on the premise that productivity depends upon method. Work, as it is usually performed, is accomplished with tremendous waste of time and effort.

A workman finds that he needs bolts for a job. The storeroom is ¼ mile away. To get the bolts, he must find the foreman, have a requisition signed and walk a total of ½ mile to and from the storeroom. An operator on the 4th floor of the building needs a brush, which is kept in the storeroom on the 2nd floor of the same building. The requisition for the brush must go through a clearing office 3 miles away before the brush can be sent up two floors where it is needed.

All of this takes so long that brushes are usually bought on petty cash from a store across the street. These are not extraordinary cases. Similar cases can be found in almost every type of industry. They contribute nothing productive to the job in hand. In fact, they interfere with production and increase costs unnecessarily. They are in short, Waste. They continue to exist because neither the operator nor his supervisor recognize them as such.

Productivity can be increased in one of two ways. The job can be "speeded up." Very little that is good can be said for this device. It operates only so long as the incentive is present, whether that incentive be based on fear or on the hope of gain. But basically the "speed-up" is defective because it speeds up



Formerly 20... now deburrs 125 per hour

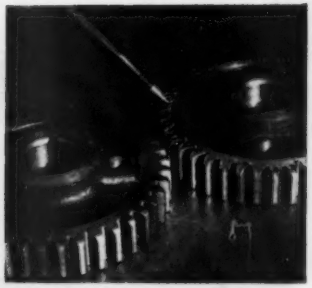
A new machine . . . the Osborn Work Holder Brushing Lathe . . . now deburrs gears and similar parts *at the push of a button!*

In the plant of Caterpillar Tractor Co., this automatic machine deburrs and finishes gear teeth *six times as fast* as the former hand method. Production now is 125 gears per hour. Output formerly was 20. Burrs and sharp edges are now removed uniformly. Every gear tooth has smooth, rounded edges and surfaces are blended.

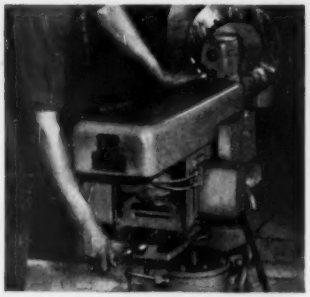
Find out how you can speed deburring and improve product quality with this versatile Osborn machine. Call your **O**sborn **B**rushing **A**nalyst today or write *The Osborn Manufacturing Company, Dept. 849, 5401 Hamilton Avenue, Cleveland 14, Ohio.*

Osborn Brushes

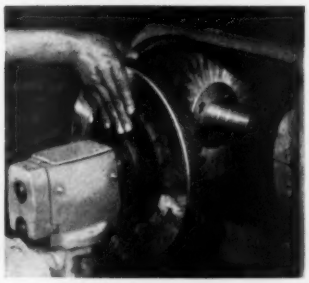
OSBORN POWER, MAINTENANCE AND PAINT BRUSHES AND FOUNDRY MOLDING MACHINES



RESULTS ARE UNIFORM. Burrs and sharp edges are removed uniformly. Every gear has smooth, uniform, rounded edges. Surfaces are blended. These gears were deburred on the machine shown at the left.



SET-UP IS SIMPLE. The machine is highly adaptable where production involves either large runs of a few parts or small runs of many different types and sizes of gears. Machine setups may be quickly made by unskilled operators. The complete brushing cycle is controlled automatically by the electronic timer which is set for any desired brushing interval to suit the size, shape or condition of part being brushed.



OPERATION IS SPEEDY. The operator mounts the gear easily and quickly. The gear advances to the face of two rotating Osborn brushes and the edge of the gear teeth makes contact with the brushes. To assure fast, positive action on each piece brushed, an automatic control reverses the direction of brush rotation on every cycle of operation. This machine deburrs 14-inch hypoid gears in 1½ minutes compared to 25 minutes for former method.

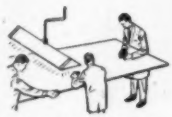
INVESTIGATE IT TODAY
for *your* problems. Users report time savings ranging from 20% to 1570% with the Osborn Work Holder Brushing Lathe. Let us demonstrate what it can do for you!

Only plywood gives you all 6

Exterior plywood samples are boiled to prove 100% waterproof bond

GRADE-TRADEMARKS on industry-inspected Douglas fir plywood do far more than identify type and grade—they are positive assurance of quality products, made, inspected and tested in strict accord with rigid U. S. Commercial Standards. Every day, plywood samples are random-selected from factory production lines. Some are given accelerated performance punishment in industry laboratories. Others get extended field exposure tests. This industry quality-maintenance program is but one good reason why Douglas fir plywood can be *depended on* for hundreds of building, remodeling and manufacturing jobs. Plywood will meet your tests, too!

U. S. Commercial Standard CS45-48 details performance requirements, gives types, grades, sizes. For free copy, write Douglas Fir Plywood Association, Dept. 4710, Tacoma, Wash.



1 Tested Quality

2 Large Panel Size

3 Cross Laminated Strength

4 Workability

5 Attractive Appearance

6 Light Weight

Douglas fir plywood is real wood, made by "unwinding" giant logs

into thin wood sheets which are inseparably cross-laminated

to form large, light panels having beauty and great strength

Douglas Fir Plywood

AMERICA'S BUSIEST BUILDING AND INDUSTRIAL MATERIAL

PLANT ENGINEERS' DIGEST

(Digest begins on page 28)

all parts of the job including the parts that are not necessary.

Work simplification, on the other hand, achieves increased productivity by removing from the job those elements which do not contribute usefully to the result desired. In other words, it attempts to eliminate waste— the waste of time, material and manpower.

To cite an example, it was found in a study of stores procedures in one company that 90 per cent of the paper work was caused by 10 per cent of the stored items. This led to the establishment of self-service storerooms with considerable savings in clerical work and forms and considerable simplification in bookkeeping. *From an article by J. C. Murtha in American Gas Association Monthly, published by A. G. A., New York, N.Y.*

Shop-Made Grease Dispenser

MANY ASSEMBLY shops frequently require small quantities of grease, usually the same amount each time. The general procedure is to scoop a quantity of grease out of a container. This practice leads to contamination of the grease and also makes it difficult to completely empty the container. To overcome these difficulties a shop-made device is suggested.

A wall bracket is made from wood

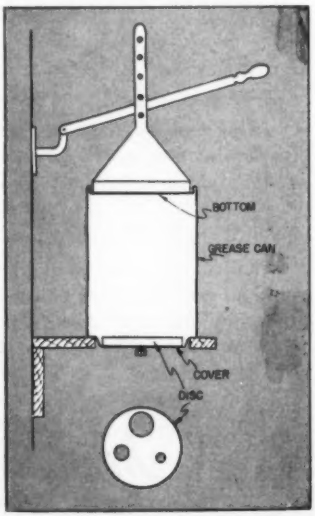


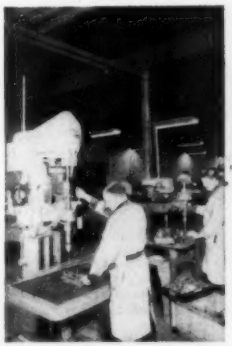
Figure gives schematic idea of dispenser as it looks when it is ready for use

Does your plant measure its growth potential by the length of its electric cords?

1. CAN YOU PLACE LIGHTS, POWER TOOLS, MACHINES OR APPLIANCES WHERE THEY'RE NEEDED MOST or is their positioning inflexibly set by the length of their electric cords and the location of *fixed* outlets? Here, maintenance man Thomas George of Connecticut Manifold Company shows how easy it is to locate a lighting fixture *exactly* where it will do the most good, as he slips its plug into a run of LTG FLEX-A-POWER®, Trumbull's pre-fabricated trolley and plug-in busway that is *one continuous outlet.*

2. MODERN DISTRIBUTION SYSTEMS MUST BE FLEXIBLE, ready for future expansion or rearrangement of lighting fixtures or production tools. This installation includes almost 1000 feet of LTG FLEX-A-POWER leading to every part of 50,000 square feet of floor space. Fixtures and small electric tools can be easily moved along the busway or, should future changes demand it, busway sections can be easily dismantled and re-assembled into a new system.

3. WHOLE LINES OF TOOLS CAN BE RELOCATED or entire lighting systems rearranged with FLEX-A-POWER. Power tools as well as the lights in this machine shop get their power supply from the LTG line above. *Learn now how LTG FLEX-A-POWER can solve your low-voltage distribution problems.* It comes in two-, three-, or four-pole types rated at 50 amps, 300 volts a-c or d-c.



NO SHORTAGE—Your Trumbull distributor's supply of FLEX-A-POWER is backed by ample factory stocks to meet all your distribution needs.

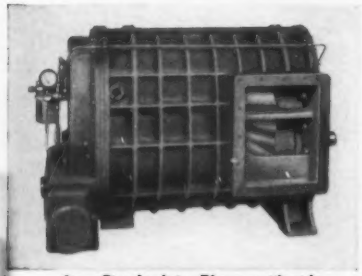
Write for circular TEC-3 on LTG FLEX-A-POWER. And remember, Trumbull has FLEX-A-POWER of other types to handle *all* your distribution needs.

Trumbull Assures LASTING FLEXIBILITY in Power Distribution

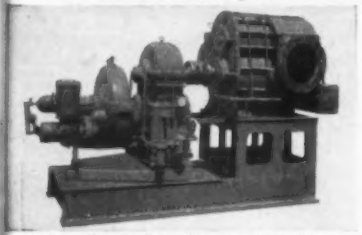
TRUMBULL (T) ELECTRIC

DEPARTMENT OF GENERAL ELECTRIC COMPANY
PLAINVILLE, CONN.

STANDARDAIRE BLOWERS *for easy* ADAPTABILITY



Standardaire Blower with side intake and discharge.



Standardaire Blower with turbine and gear drive unit.

Standardaire Blower with side intake and end discharge.

To meet the specific needs for industry, Standardaire's unique design provides for maximum flexibility in meeting unusual requirements for intake and discharge connections. For example, the blower intake or discharge ports can be located on the end, top, bottom or sides ···· two intake or discharge ports may also be provided when necessary. These exclusive features, plus provisions for direct drive by a power unit of your choice, are typical examples of Standardaire's adaptability.

Standardaire Blower with single top intake and two side discharge ports.

Installation showing three Standardaire Blowers.

Write . . .

Read Standard Corporation, Dept. F66
370 Lexington Ave., New York 17, N.Y.
BLOWER-STOKER DIVISION

AXIAL FLOW STANDARDAIRE BLOWER

READ STANDARD
CORPORATION

NEW YORK · CHICAGO · YORK · LOS ANGELES

PLANT ENGINEERS' DIGEST

(Digest begins on page 28)

verted position. The supporting platform should have a circular hole cut in it. The opening should be smaller than the diameter of the tin can. The cut may be recessed, if desired, to fit the rim of the container's lid, provide more rigid support, and to prevent side movement of the can.

The piston and lever may be made from wood or metal, and should be fixed to the wall above the bracket.

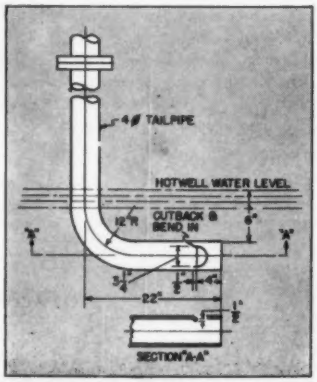
All that is then needed is a metal disc in which are cut several holes off center depending upon the amounts of grease required. A screw with a knurled head should be fixed to the center of this disc. A cover from a can is drilled with a larger hole than any in the disc and in the same off center position.

The drilled cover and the disc take the place of any new lid on a container of the same size.

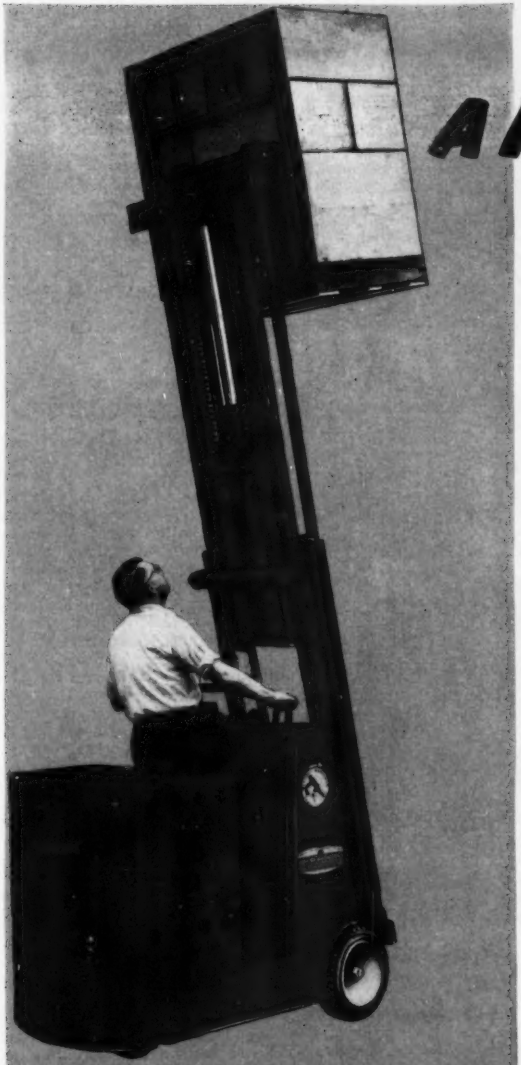
It should be possible, when putting a new tin can of grease into use to force the bottom of the tin can out by the piston. This is the best procedure. If this cannot be done, the bottom must be cut out. If forced out by the piston, it can remain in position on the plunger. *From Scientific Lubrication, published by Scientific Publications, Wellington, Shropshire, England.*

Ejector Exhaust Silencing

RUMBLING and spattering associated with steam exhausting through a submerged line from an ejector can be reduced in several ways. One method that has been successfully used by W. J. Bohnet of Union Carbide & Carbon Corp, is passed on to



Sectional view of pipe shows how the cutback portion should be bent back



How to buy A FORK TRUCK that will really reduce your handling costs

THE RIGHT WAY to select a fork truck is to make an honest comparison of types and makes.

GAS OR ELECTRIC?

Unless your operating conditions are unusual, you can enjoy the inherent advantages and economies of *Electric* fork trucks: 3 times longer life, ⅓ the operating cost of gas, no fumes, no noise, smoother power flow.

WHICH MAKE OF ELECTRIC?

A factual comparison will show that Lewis-Shepard Spacemaster Electric Fork Trucks give you more of the features you want, the quality you need, and the savings you expect.

1. **Greater Dependability** — less routine maintenance.
2. **Operate in Less Space** — compact design and smaller turning radius.
3. **Greater Speed** — more powerful traction motor, faster lift motor.
4. **Safer Reverse Operation** — with Standrive.
5. **Full Free Lift** — essential where headroom is limited.
6. **Smoother, Timed Acceleration** — with Magnetic Controls.
7. **99% of Foot Braking Eliminated** — with dynamic braking.
8. **No Grease Points** — sealed ball bearings.
9. **Absolutely No Under Truck Adjustments** — all maintenance from topside.
10. **Maximum Stability** — lowest center of gravity.

LEWIS-SHEPARD

Nation-wide Service — See "Trucks, Industrial" in your Yellow Phone Book

The "MASTER" Line

TO HELP YOU BASE YOUR DECISION ON FACTS

Get this handy "Fork Truck Comparison Chart". It permits you to quickly make your own graphic, unbiased comparison. Lists buying "guides" . . . lets you evaluate the comparative merits of each manufacturer's trucks. Write for it now.

Lewis-Shepard Products, Inc.
18 Walnut St., Watertown 72, Mass.

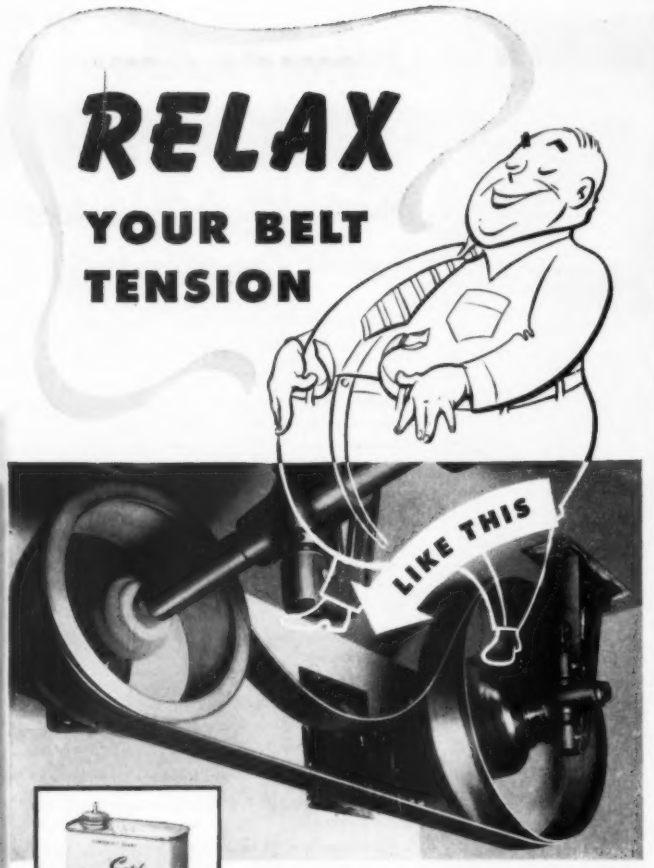
Please send me a "Fork Truck Comparison Chart" and the SPACEMASTER Catalog.

Name_____

Company_____

Street_____

City_____ State_____



CLING-SURFACE

MAKES BELTS
1. WORK BETTER
2. LAST LONGER
3. SAVE POWER

Stop running your transmission belts *tight!* Belts run under high tension, stretch and constantly require "take-ups" which cause costly down time. They increase the friction load, waste up to 50% of your power and place needless strain on bearings and shafting.

By merely applying Cling-Surface to your belts, you greatly increase their "grip" and by relaxing the tension, you actually *increase* the surface areas the belts "cling" to. This "slack belt" operation practically eliminates belt repairs, makes belts, bearings and shafting last longer and delivers MORE POWER to your machines.

The ONLY belt preservative in existence that has passed U.S. Government requirements, Cling-Surface is also the ONLY brand that DARES to recommend this economical, trouble-free, "slack belt" way to end belt worries. A trial will convince you! Sold on MONEY BACK GUARANTEE since 1896. Ask your mill supply man or,

SEND FOR THIS FREE BOOK
"THE TRUTH ABOUT ALL BELT DRESSINGS"

CLING-SURFACE CO. 1046 NIAGARA STREET BUFFALO 13, NEW YORK
CLING-SURFACE CO. OF CANADA, LIMITED, TORONTO, ONTARIO

PLANT ENGINEERS' DIGEST

(Digest begins on page 28)

help others who have this problem.

A half moon section is burned out of one side of the outlet pipe, about 1 pipe diameter from the pipe's end. The opening is cut back ½ in. at both ends of the half moon diameter. With the bending of the lip, as shown in the figure, the job is completed. *From Powerfax, published by Elliott Co., Jeannette, Pa.*

Controlled Heat Dries Plaster Properly During Cold Weather

IN COLD WEATHER, the temperature of the building being plastered should be kept between 55 F and 70 F. Besides, ventilation should be provided to dry the plaster properly.

Tests have shown that plaster which is set but still wet has about half the strength of dry plaster.

During cold weather it is advisable to start heating the building about a week before plastering, bringing the temperature in the building to from 55 F to 70 F. During plastering, and until the plaster is dry, this temperature range should be maintained.

If the building is heated just when the plastering begins, or if the building is heated only during working hours and then allowed to cool off at night, the temperature change may cause sufficient movement in the building frame, and in the plaster, to produce cracking.

A heater should be placed as near the center of the room as practical to avoid concentrated or irregular heating of the plastered areas. It is also important to prevent the temperature from rising excessively, that is to 80 F or 90 F, to avoid drying out the plaster before it is set.

Ventilation should be provided to aid in drying the plaster properly. When too much ventilation occurs (for example, with strong winds and relatively high temperatures), the plaster may dry out before it is set and consequently will have lower strength and less resistance to cracking. Where no ventilation is provided, the plaster may "rot" or "sweat out" if it remains wet for several days. This condition also reduces the strength of the plaster.

It is suggested that the windows be glazed and ventilation controlled by opening the windows about 2 in. top and bottom, or about 4 in. for side-pivoted windows. If glazed sash are not in place, the openings should be screened with cheesecloth or similar material. *From This Earth, published by H. J. Kaiser Co., Oakland, Calif.*

Why is there a difference in ROLLER CHAINS?

For the past sixty-two years the Diamond Chain Company has continuously devoted its efforts to the attainment of higher quality in the product, and the constant expansion in the use of roller chain as a superior mechanical means of power transfer. . . Research, testing and engineering developments have always been factors of first consideration at Diamond Chain.

FOR EXAMPLE:—

1. Diamond Chain has improved the pin and bushing holes in the link plates by proper pitch hole preparation. Pins and bushings are case hardened.
2. Diamond Chain has long recognized that certain types of internal stressing of chain parts would increase fatigue resistance. To this end, link plates have been specially processed and chain rollers and other parts have been shot-peened since 1944.
3. Diamond Roller Chain is constantly improved. Time tested improvements become standard for production as soon as established and certified.
4. Fully equipped and well staffed chemical and physical testing laboratories have made it possible to control raw material specification, their treatment and processing.
5. Diamond Chain has established production processing methods and quality controls through multiple inspection to insure uniformity of high quality in continuous production runs.
6. As always the Diamond trade-mark on roller chain is the Hall Mark of Quality.

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Refer to the classified section of your local telephone directory under the heading CHAINS or CHAINS-ROLLER

OPERATION & MAINTENANCE of industrial service and production facilities

Edited by H. E. B. Anderson

Siphon Oil Feeder

Contributed by H. S. Forker

A SIMPLE OIL FEEDER can be constructed from a length of copper tubing, about 12 in. long. Bend the tubing in a U-shape, with one leg slightly longer than the other. Drawing 3 or 4 lengths of twine, saturated in oil, through the tube provides a siphon prime.

Supported in position over the bearing to be lubricated, with the short leg of the U-tube placed in an open oil can, the longer leg will siphon oil from the can, letting it drip on the bearing.

With a chosen oil viscosity, the flow through the tube to the bearing can be regulated by the amount of string used in the wick.

Hot Cable for Cold Sand

LEAD-COVERED heating cable, in a specially designed jacket, prevents sand freezing in the discharge pipes of dewatering towers at the Manumuskin, N. J. plant of the George F. Pettinos Co.

Sixty-ft lengths of the heating cable are installed in a sheet-metal form, fitted over the two 2-in. discharge pipes and a section of the lower part of the tank. Whenever the temperature drops below 28 F, an operator flicks a switch, and keeps the sand from freezing and clogging up the pipe.

Photo: General Electric Co.

Cable-wrapped discharge spout permits free flow of sand in cold weather

Before the heating element was installed, it was given a protective weatherproofing with a coat of cork granules in a mastic insulating material. This coating also serves to retard heat dissipation to the outside air.

The operation of the cable has replaced the old method of keeping the pipes open, which required a mechanic to climb up on the 50-ft towers to thaw out the frozen sand with a heavy-duty blowtorch.

Two-Way Gage

A TWO-WAY GAGE used on rotating bands for artillery projectiles, simultaneously inspects the bands for wall thickness and depth, at the Chase Brass & Copper Co., Waterbury, Conn.

As the rotating band is turned in the jig, the dials indicate wall thickness and depth continuously so that any deviation from specifications in any part of the band is detected quickly.

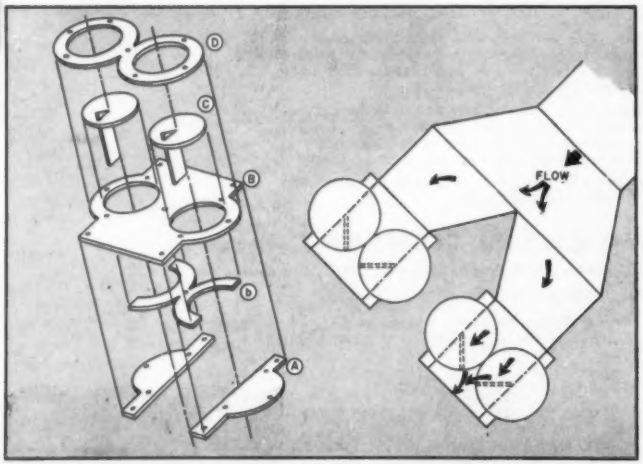
Use of the gage, designed by the

Centering Device for Loading Bulk Material on Two Conveyors from One Chute

Contributed by Charles E. Payne, Jr.

FEEDING TWO CONVEYORS from one discharge chute usually presents the problem of centering the flow of material on each conveyor. One answer to this problem is the centering device which was installed in our plant.

The preliminary step in building the device into the chute was welding a plate section on each side of the chute. These plates, which extend the chute cover into a semicircular "bulge," provide the mounting for the rotary-type gates of the device.



Exploded view of deflector assembly shows relative position of parts required for fabrication of the units. Plan view illustrates position of deflectors in chutes

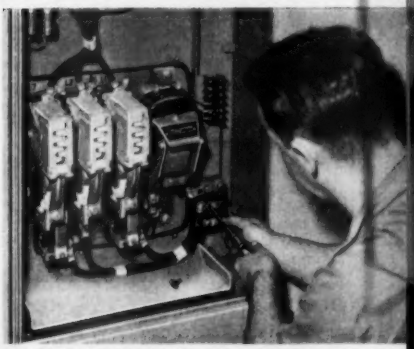
These gates, or deflectors, are essentially flat steel rectangles, set vertically in the chute and mounted so as to rotate 90 degrees, from the closed position across the chute to a position along the side of the chute, when wide open. Partial opening of a pair of deflectors directs the material flow as desired.

The various parts, as shown in the exploded view, are: A, the chute cover extension plates; a cover plate, B, with a circular segment, b, welded on its under side to form a lip; the deflector, C; and a clamping ring, D, to secure the deflector in any position selected to control the flow.

Plate B covers the opening cut in the chute cover, and supports the deflectors in the chute. The circular plates mounting the deflectors are supported in position by the lip formed under plate B. Clamping ring D is fitted over the entire assembly and is tightened down to hold the gate deflector in position by preventing the rotation of the circular plate.

EASY TO INSTALL AND INSPECT. Interchangeable units; main bus completely accessible; incoming line connections are easily made.

EASY TO WIRE. Four-inch wiring trough; components accessible from all sides; front-connected starters; doors swing more than 90°.



EASY TO SERVICE. Units are easily disconnected from bus and locked in test position (above). Barriers between units are easily removed to facilitate wiring (below).

FORD MOTOR COMPANY OFFICIALS INSPECT THE INTERCHANGEABLE UNITS OF THE . . .

New G-E Motor Control Center

Since January, over 10,000 men from production and management of leading industries (see above) have taken a thorough look at the latest equipment for the centralized control of a-c motors up to 200 hp. Their reports indicate enthusiastic approval of what they saw. Here's why:

VERSATILE. Because units are easily interchangeable without waste space, a variety of arrangements can be made. For example—two Size 1 or 2 starter units require the same space as a Size 1, 2, or 3 reversing starter.

ACCESSIBLE. A four-inch continuous wiring trough provides ample wiring space. Components are mounted on an easy-to-handle frame and accessible from all sides when lifted from cabinet. Starters are front-connected. Master terminal boards can be swung out of compartment for extra working space around conduit.

PROTECTED. Will withstand 25,000 amperes RMS short-circuit current, substantiated by certified Laboratory tests.

For more information on this new G-E motor control center, contact your nearest G-E apparatus sales office or write for Bulletin GEA-4979A today. *General Electric Company, Schenectady 5, N. Y.* 710-42

GENERAL ELECTRIC

OPERATION & MAINTENANCE

(O and M begins on page 50)

Dials register wall thickness and depth as the rotating band is turned in jig

plant quality control engineers, makes inspection more complete and greatly reduces the time formerly consumed when using two micrometers to measure the bands.

Another Use for Oil Cans

Contributed by Jack Kvensie
Allis-Chalmers Manufacturing Co.

THE USE OF OIL CANS for applying glue to assembled sieves is an innovation in our mill machinery shop. The oil cans make possible a smoother application of glue to cracks and openings than was previously possible using a brush.

The narrow spouts of the oil cans also allow deeper penetration of the glue into the openings with less effort on the part of the assembler. Oil cans of both the gravity feed and pressure feed types have been used successfully in this application.

Light-Duty Crusher

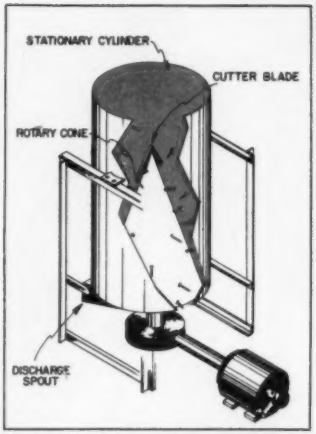
Contributed by G. F. Suchy

A LIGHT-DUTY CRUSHER which was needed in our plant, had to be designed to provide the following features: capability of crushing large lumps, cakes or loaves in various processes; inlet opening at the top; a minimum of restrictions to the flow through the crusher; and simplicity of construction.

A crusher which we designed and built in the shop, incorporated the majority of these features. The inlet is the same size as the main casing, to cut down entry restriction. The unit is rugged, and there is only one moving part in the assembly.

The crusher is sanitary, because its inner surfaces are readily accessible for washing and inspection. The design obviates pre-crushing or breaking of large lumps, since the top opening is so large. The crusher cannot choke up, because small pieces fall down through the crusher by gravity, as they are broken off.

The rotating cone is geared for slow movement, which provides the advantage of minimizing air currents which blow powdered product dusts into the surrounding air.



Sketch shows basic elements of crusher designed by author for light-duty work

Sheet Metal Sawing Hint

Contributed by F. E. Riley

THE MECHANIC faced with the problem of sawing a piece from a large sheet of metal, and equipped with only an ordinary hacksaw, can do the cutting job with little or no difficulty. The solution lies in cut-

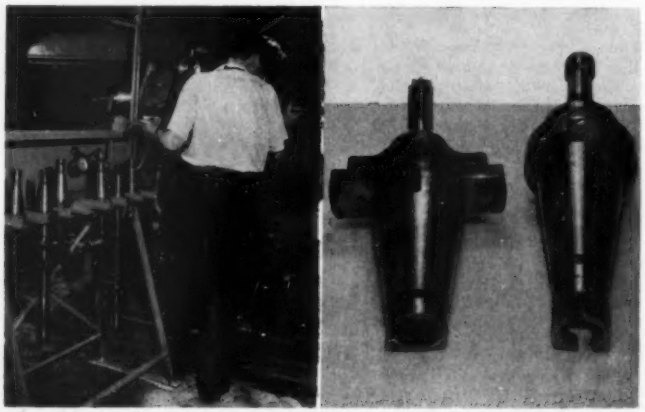
Quick-Change Arbors Speed Milling Operations—10 Seconds Per Change

A PNEUMATICALLY OPERATED draw bar has been developed for a No. 3 Cincinnati milling machine by machine shop personnel at the Temco Aircraft Corp., Dallas, Texas. It has reduced the time required to change arbors from an average of 3 minutes to an average of 10 seconds per change.

The attachment utilizes a 6-in. pneumatic cylinder, operating at 40 lb pressure, and a quick change adaptor on the arbors. The pin on the draw bar is coordinated with the key on the spindle. All the operator has to do to change arbors is to press a button to release pressure on the cylinder, turn the arbor a quarter turn to disengage the quick change key, remove the arbor, insert a new arbor, turn it a quarter turn to engage the quick change key, and press another button to restore pressure.

The milling job in question was a heavy welded assembly which called for a variety of milling, boring, center-boring and reaming operations at very close tolerances. Altogether, 10 changes in arbors were required, and due to the weight of the assembly, it was not considered practical to move the work to different machines for different operations.

The pneumatically-operated draw bar, although designed for this particular application, can be applied to any mill by changing bar length.



Left: Machinist changes arbors on milling machine, using pneumatic draw bar. Right: Old style arbor compared with new type equipped with bayonet fitting

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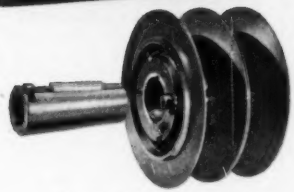
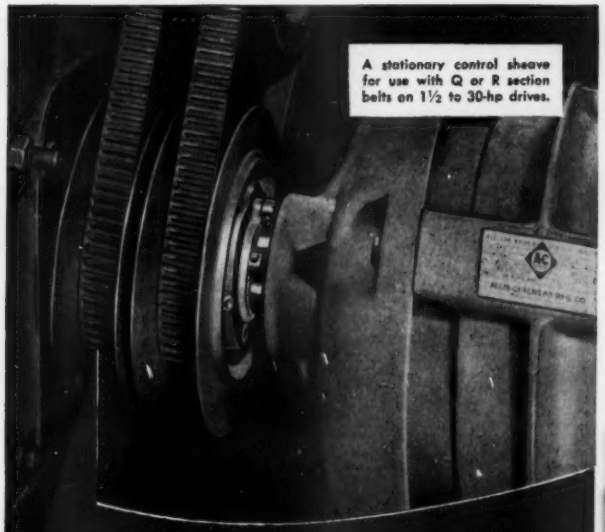




A stationary control sheave for use with Q or R section belts on 1½ to 30-hp drives.

NOW!

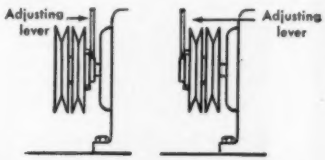
Wide Range Vari-Pitch Sheave has 3 New Advantages

1 Magic-Grip Mounting

The widely used *Magic-Grip* tapered bushing is now supplied with the Wide Range *Vari-Pitch* sheave, making it the fastest mounting sheave of its type on the market. Turning only one screw makes or breaks the vise-like grip of sheave bushing on motor shaft.

2 Fast Adjustment

To change sheave diameter — thereby changing speed — simply turn a single adjusting screw, *using a lever rod* that slips through a hole in the head of the screw. No more fumbling with screw drivers. Adjustment is fast and accurate.



3 Adjusts From Either Side

Sheave can be mounted on motor shaft so adjusting screw is either toward or away from motor bearing, as indicated above. This feature is especially important in installations where space for adjustment is limited. It's the only sheave of its type with this feature.

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Send me complete specifications and engineering data on the new Wide Range *Vari-Pitch* sheave . . . 20S7811.

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• Here's a check list of the complete line of WRIGHT Hoists that will show you the many models available for a wide variety of lifts around shop or plant.

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STYLE	TON CAPACITY
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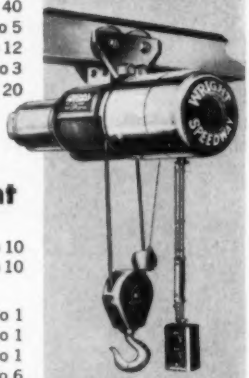
☐ Top running, hand traveling	1 to 20
☐ Underhung, hand traveling	1 to 10
HOISTS	
☐ Wright Safeway, light, portable	½ to 4
☐ High speed, improved	¼ to 50
☐ Clevis-connected	¼ to 10
☐ Handwheel, extended	¼ to 3
☐ Twin hook	¼ to 10
☐ Differential	¼ to 1½
TROLLEY HOISTS	
☐ Wright Safeway	½ to 4
☐ Wright Army type Safeway	¼ to 10
☐ Hi-Way 600 type	¼ to 24
TROLLEYS ONLY	
☐ Timken	¼ to 40
☐ Hyatt	¼ to 5
☐ SARB	¼ to 12
☐ Wrightway	½ to 3
☐ Double beam	2 to 20

WRIGHT SAFEWAY

WRIGHT SPEEDWAY



WRIGHT
Motor-driven Equipment

CRANES	
☐ Top running	1 to 10
☐ Underhung	1 to 10
HOISTS	
☐ Frame 1, Speedway	¼ to 1
☐ Frame 1, Speedway, close headroom	¼ to 1
☐ Frame 1, Speedway, long-lift	¼ to 1
☐ Frame 2, Speedway (all suspensions)	½ to 6
☐ Frame 3, Speedway (all suspensions)	1½ to 10

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WRIGHT
Hoists
Trolleys
Cranes

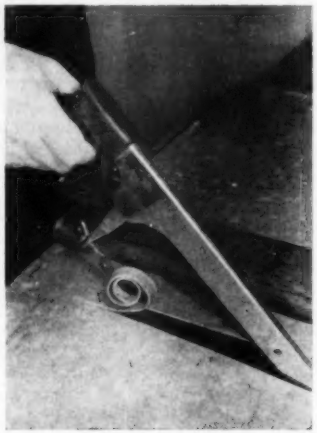
OPERATION & MAINTENANCE

(O and M begins on page 50)

ting a space wide enough to allow the saw frame to pass through the sheet, as the cut is made.

A fine tooth blade is fitted to the saw frame and the first cut is made at the edge of the sheet, until the frame catches the edge of the sheet. Then, a second cut is started about ½ in. from the first, and continued parallel to the first until progress is again halted by the saw frame.

The tongue of metal between the cuts is then rolled back, leaving a ½-in. gap into which the saw frame



Near end of saw cut, the metal tongue is rolled up alongside the saw blade

can pass and thus allow the cuts to continue. Alternate cutting and rolling back of the strip is continued until the cut is completed.

Although 4 ft of cutting must be done in order to cut a 2 ft.-wide sheet, and a ½-in. strip of metal is wasted, the method provides an "out" if more elaborate tools are not available.

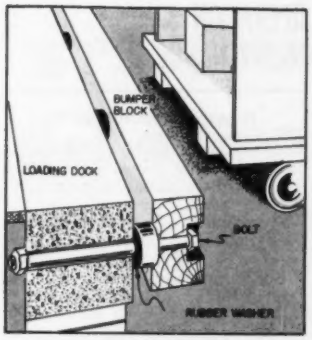
Rubber Bumper for Trucks

Contributed by R. F. Graefe

THE RESOUNDING JOLT that resulted each time a heavy truck backed into our loading dock was the source of increasing building damage. Also, the annoyance and safety hazard to dock personnel was becoming an important problem.

The use of wooden bumper blocks was decided upon, but consideration was given to the fact that the blocks would not be resilient enough to absorb the full impact, and would themselves be expendable.

To forestall this condition, when



Rubber washers between bumper block and dock absorb impact of heavy trucks

the blocks were installed on the dock edges, rubber washers cut from discarded rolls were slipped over the holding bolts, and positioned between the wooden bumper block and the loading dock edge.

These rubber washers absorb most of the shock of a truck backing into the dock. The holding bolts, mounted in pipe sleeves, run through the dock wall, slide with the jolt, with no effect on the dock structure.

Fork Trucks in Dual Role

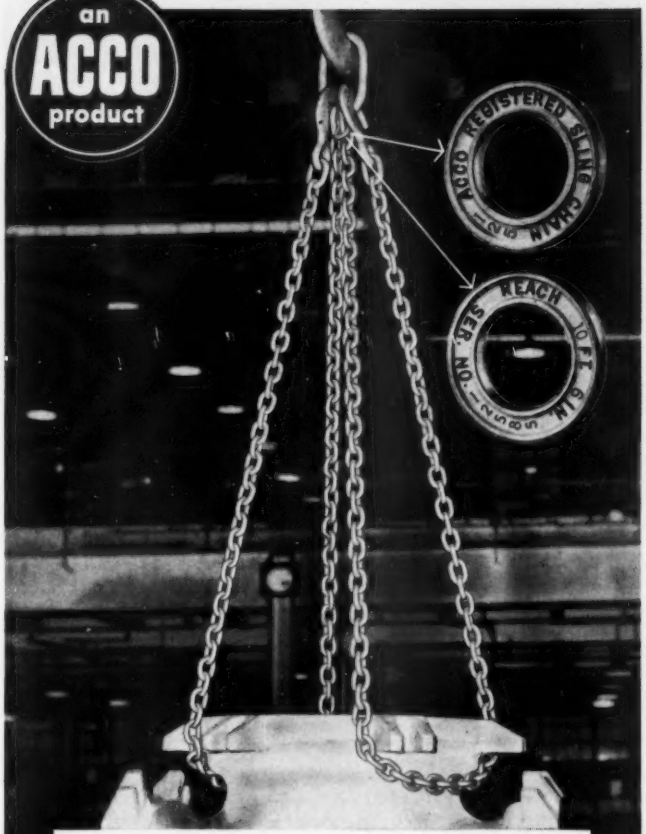
FORK TRUCKS have been given additional versatility by a simple modification applied by the Allis-Chalmers Mfg. Co. at its Hawley Works. The trucks are put to double duty as prime movers for four wheel carts used to haul heavy bar stock and similar long loads in the storerooms and shops.

The carts are equipped with a hitch consisting of a steel plate welded to the end frame of the cart, and a pin welded solidly to the plate and projecting downward. A

Position of fork truck blade before raising forks to engage pin on cart

hole large enough to fit freely over the pin has been drilled in the end of one of the blades on the fork truck. With this arrangement, the truck operator simply centers the hole under the pin and raises the

an ACCO product



ACCO Registered Sling Chains are Versatile

● Here an ACCO *Registered* Sling Chain is used in a double basket hitch. It could also be used as a two-legged bridle, or as a double choker. The tough 125 Endweldur ACCALLOY Chain is much lighter in weight and is easy to handle. It has great service life. The permanent identification ring on every ACCO *Registered* Sling Chain is your sign of safety and guarantee of quality.

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OPERATION & MAINTENANCE

(O and M begins on page 50)

fork to engage the pin. This operation is fast and allows the operator to make the coupling without leaving the truck.

Availability of trucks for this purpose has been increased by using platform trucks in the same manner. With the platform trucks, a hole has been drilled in the forward end of bed to receive pin on cart.

Drill Gage Mounting

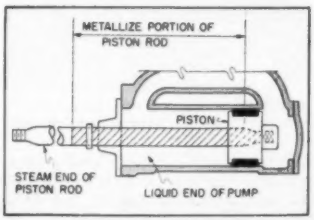
Mounting drill gage on bench or shop wall keeps it handy for drill checks

Less Brass, More Brawn

Contributed by M. J. Hurd

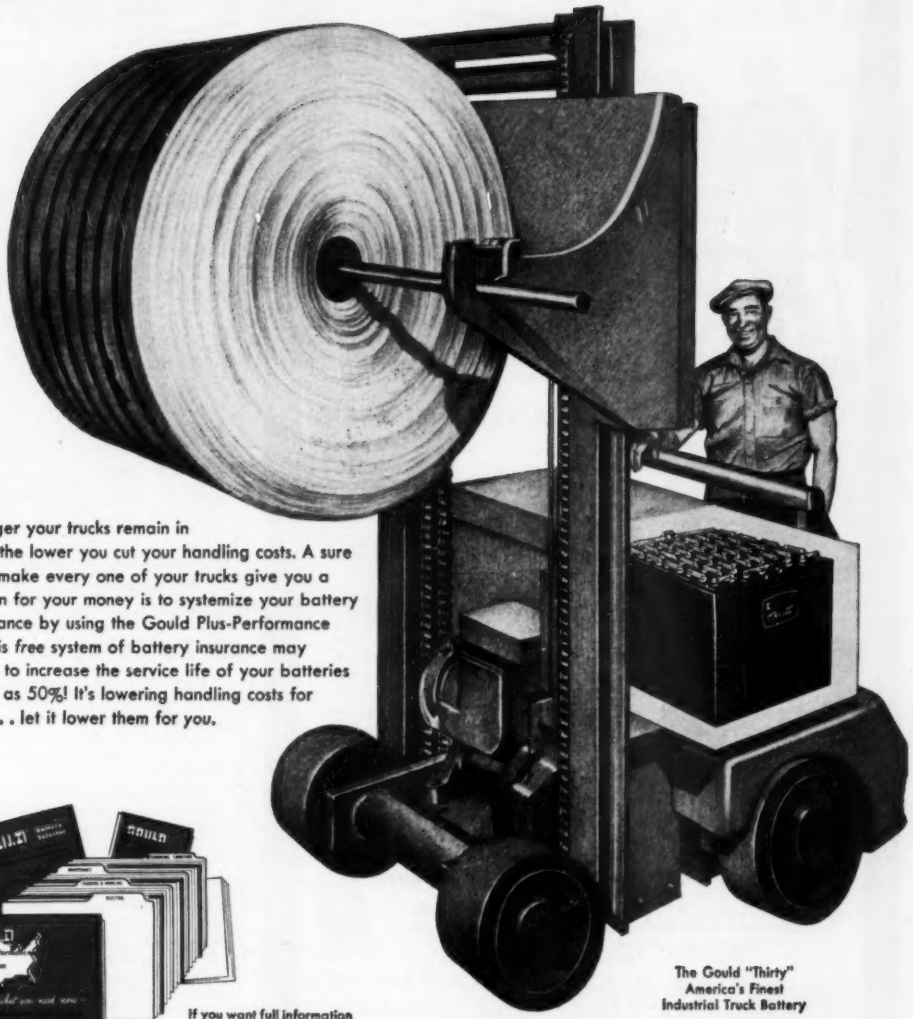
THE PISTON ROD for a double acting simplex pump handling a corrosive and abrasive liquid was of one-piece brass construction. It required replacement once a year because of serious wear in the liquid and packing contact length of the rod, and this frequent replacement called for a change in rod design or material.

An experiment in material change, which was completely successful, was tried by making the rod of one piece of cold rolled steel. The liquid contacting surfaces were undercut and built up with hard stainless steel sprayed metal, finished smooth. A heavy brass cap nut was substi-



Cross-section of pump shows how metallizing protects pump rod from liquid

SYSTEMIZE BATTERY CARE...
Get a Good Run for Your Money!



The longer your trucks remain in service, the lower you cut your handling costs. A sure way to make every one of your trucks give you a good run for your money is to systemize your battery maintenance by using the Gould Plus-Performance Plan. This *free* system of battery insurance may be able to increase the service life of your batteries as much as 50%! It's lowering handling costs for others . . . let it lower them for *you*.

If you want full information on how this plan can lower your handling costs, write Gould Battery Information Headquarters.

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HOW MUCH ARE SLIPPING ACCIDENTS COSTING YOU?

ACCIDENT REPORT

Cause of accident:
Man fell on a slippery floor.

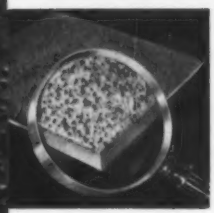
Means of prevention:
Install A.W. ALGRIP Abrasive Rolled Steel Floor Plate.

There's an easy, economical way to end slipping accidents that steal man-hours and drag production down. Put positive non-slip protection in your plant with exclusive A.W. ALGRIP Abrasive Rolled Steel Floor Plate.

NON-SLIP—EVEN ON STEEP INCLINES!

ALGRIP is made by rolling tough abrasive grain (the same kind used in grinding wheels) *uniformly* as an integral part of the steel plate's upper portion. When you walk on ALGRIP, hundreds of tiny safety brakes grip your feet at every step. *Result:* It's virtually impossible to slip—even on steep inclines.

WEAR WON'T WEAR OUT ITS SAFETY!



ALGRIP's safety isn't merely a surface treatment. Note the even distribution *and* depth of the abrasive grain. As the surface wears, new particles are exposed, so ALGRIP keeps its non-slip qualities for a lifetime. It needs no maintenance. Rolled steel makes it stronger than other abrasive floorings. It withstands hard blows and heavy loads without cracking or breaking. And thinner sections can be used without reducing load carrying capacity.

Get Full Details of ALGRIP Today

Our new Booklet A-5 gives complete technical details, suggests uses. Write for your free copy. *It may save you countless hours and dollars!*

A.W. ALGRIP ABRASIVE ROLLED STEEL FLOOR PLATE

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Over 125 years of iron and steel making experience.

OPERATION & MAINTENANCE

(O and M begins on page 50)

tuted for the original follower nut, to protect the rod threads.

The new rod has been in service over 2 years, and its use has saved the 59.5 lb of brass formerly used for each rod. The built-up rod required only 4 lb of stainless steel wire.

This same procedure has, in another case, successfully replaced a solid stainless rod.

Multiple Sling for Pipe Handling

Photo: Caterpillar Tractor Co.

Fabricated sling capable of handling 12 lengths at one time is used to speed unloading cast iron pipe at plant site

Do Your Caulking Right

THE PRIMARY REQUIREMENT of a good caulking job is that the compound must stick tightly in place, and in order for the compound to stick, the surface must be properly prepared.

The American Asphalt Roof Corp., Kansas City, Mo., offers the following detailed procedure for a sound caulking job.

1. The preparation of the surface is most important.

a. Clean out the cracks or joints first—all loose particles, dirt, rust, scale, etc., must be removed so as to have a firm base.

b. Be sure surface is dry—a wet surface will prevent proper sticking.

c. On dry or unpainted wood surfaces, apply linseed oil to stop pores and prevent back moisture.

d. On iron, stone, brick or stucco, apply a coat of shellac for the same reason.

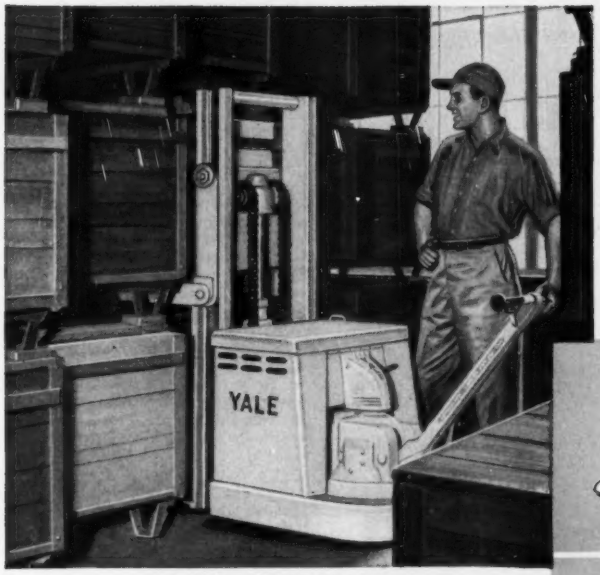
2. On deep, large openings, use oakum, tamping in firm, and fill crack to one-half inch of surface.

3. After surface is thoroughly prepared, apply caulking compound.

a. If using gun grade, go slowly, forcing material into crack and

Now...Industry does big-truck jobs at small-truck cost with

YALE WORKSAVERS



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SOLVE Time-Space Problems!

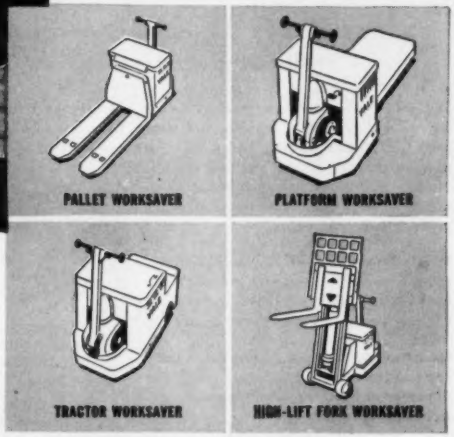
Move loads into and out of *any* storage or production area — easily and efficiently — with YALE ELECTRIC WORKSAVERS, industry's leading *powered* hand trucks!

SOLVE Manpower Problems!

Practically any man in your plant — picked at random — can transport, lift and stack multi-ton loads, safely, surely, smoothly — with a YALE ELECTRIC WORKSAVER!

SOLVE Cost Problems!

YALE ELECTRIC WORKSAVERS are low in initial cost, economical to maintain, operated easily by anyone. The money-saving answer to your handling problems!



PALLET WORKSAVER | PLATFORM WORKSAVER

TRACTOR WORKSAVER | HIGH-LIFT FORK WORKSAVER

YALE WORKSAVER ELECTRIC HYDRAULIC POWERED HAND TRUCKS move right in—where big trucks are too big to fit—or too heavy for your floors. Yet they give you all the big-truck advantages...at far less cost: power travel—forward and reverse...power hydraulic lift...speed...everything! That's why, where size and weight make big trucks impractical, industry prefers YALE WORKSAVERS. Powered by economical electric power—they're your answer to countless materials handling problems in every plant or factory.

You'll Be Amazed By a Demonstration in Your Own Plant or Warehouse!

See it move about—lifting, transporting—through narrow doors, into elevators, and freight cars, over "low-load" floors. See how it saves you time and money. Ask your Yale Representative! He'll arrange a WORKSAVER demonstration in *your* plant. No obligation, of course!

There's a Yale Worksaver to meet your every need!

Yale is a registered trade mark of The Yale & Towne Mfg. Co.

The Yale & Towne Mfg. Co., Philadelphia 15, Pa

YALE

MATERIALS HANDLING EQUIPMENT

MAIL THIS COUPON TODAY

The YALE & TOWNE Manufacturing Co., Dept. 4710
Roosevelt Blvd. & Haldeman Ave., Philadelphia 15, Pa.

Cutting costs with YALE WORKSAVERS interests me, too.

☐ Please have your local Representative call on me.

☐ Please send me a free copy of *Picture Story of Yale Materials Handling Equipment.*

*Company*_____

*Name*_____ *Title*_____

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In Canada write: The Yale & Towne Mfg. Co., Box 207—Postal Sta. "A," Toronto

Gas and Electric Trucks • Hand Trucks • Hand and Electric Hoists • Pul-Lifts • *Worksavers*

Niagara's HYGROL DRIES AIR BEST

with exact moisture content

- to control your product's quality
- to prevent condensation on your product or material
- to prevent changes due to moist air in contact with your product
- to protect your material from dampness
- to protect your processing of moisture-sensitive material
- to DRY your material or product
- to pack or store your product safe from moisture damage
- to get exact moisture control for the precise atmosphere condition you need
- to provide precise atmospheric conditions for testing
- to increase your air conditioning capacity
- to DRY large quantities of fresh air from outdoors

The Niagara's Controlled Humidity Method using HYGROL moisture-absorbent liquid is

Best and most effective because . . . it removes moisture as a separate function from cooling or heating and so gives a precise result constantly and always. Niagara machines using liquid contact means of drying air have given over 20 years of service.

Most reliable because . . . the absorbent is continuously reconcentrated automatically. No moisture-sensitive instruments are required to control your conditions.

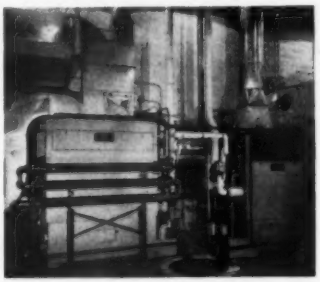
Most flexible because . . . you can obtain any condition at will and hold it as long as you wish in either continuous production, testing or storage.

Easiest to take care of because . . . the apparatus is simple, parts are accessible, controls are trustworthy.

Most compact, taking less space for installation.

Inexpensive to operate because . . . no re-heat is needed to obtain the relative humidity you wish in normal temperature ranges and frequently no refrigeration is used to remove moisture.

The cleanest because . . . no solids, salts or solutions of solids are used and there are no corrosive or reactive substances.



Niagara Controlled Humidity Air Conditioning

This method removes moisture from air by contact with a liquid in a small spray chamber. The liquid spray contact temperature and the absorbent concentration, factors that are easily and positively controlled, determine exactly the amount of moisture remaining in the leaving air. Heating or cooling is done as a separate function.

For complete information write

NIAGARA BLOWER COMPANY

Dept. PE, 405 Lexington Ave., New York 17, N. Y.

District Engineers in Principal Cities of United States and Canada

OPERATION & MAINTENANCE

(O and M begins on page 50)

leaving sufficient bead on the surface to make contact points strong. The material will set slightly into the crack so sufficient surface bead should be left to allow for this.

b. If using knife grade, do the same thing. Press firmly into crack and also press tightly against contact points.

c. If basic surface is rough, such as stone, brick or stucco, tap the caulking compound lightly with the bristle end of a paint brush. This will force a tight contact with rough surface.

d. When filling cracks in walks, steps, or other stone surfaces, be sure to apply shellac or varnish first. This seals the stone pores and stops capillary attraction (or drawing of oils out of materials). If this is not done, caulking compound will dry out. Also sprinkle a little dry portland cement over finished job if there is danger of job being stepped on.

e. It is always a good policy to paint over caulking jobs, as painting forms a surface protection and greatly prolongs the life of the caulking.

f. In filling cracks due to broken mortar, the edges where the caulking is to be applied should first be washed or cleaned so there will not be a dirt film to destroy adhesiveness.

g. In applying knife grade, have a small can of paraffine oil handy. Dip the caulking tool in this oil when caulking compound starts sticking to tool. When smoothing the surface, keep the tool clean in the same way.

h. Do not thin caulking compound, either knife or gun grade, with paraffine oil. Use regular caulking compound thinning oil, or in an emergency use naphtha.

i. To prevent surface hardening in the container due to exposure—with knife grade—smooth the material down level in the package and pour a little water over the surface. This will keep the air away.

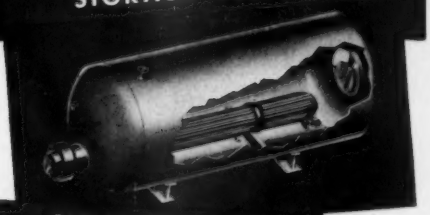
j. To make colors for small patchwork, mix small quantity of color in oil, or mix dry color into the product, and work in well wtih a trowel.

k. If you want to thicken up gun grade in small quantities for special patchwork, use small quantity of abestine, talc or other fine inert pigment. Mix in thoroughly.

4. After caulking the building proper, including windows, doors, and all openings, don't forget the following places: foundation base, roof coping, cracks in brick and stucco, foundation cracks or decayed mortar, and stone steps.

ADSCO INSTANTANEOUS HEATERS

STORAGE HEATERS



STEAM TRAPS

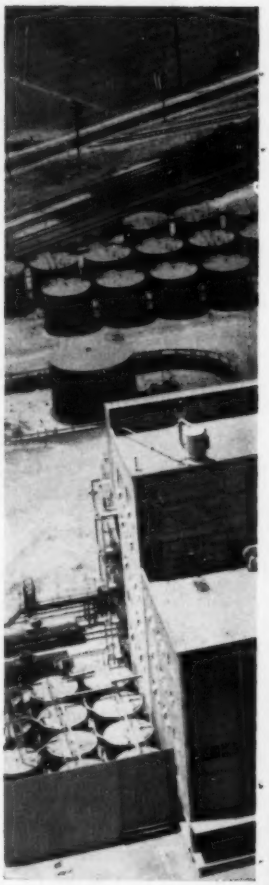
Choose ADSCO when you want a dependable instantaneous heater. For ADSCO specializes in instantaneous heaters, making all types in any size you need. Heater shells are seamless steel pipe, carefully cut and welded. Tube bundles of pure deoxidized seamless copper tubing formed into U-bends. Semi-steel covers are high-tensile, fine-grained castings. ADSCO heaters are ideal for general service hot water, process work, swimming pools, dishwashing machines... Write for ADSCO's new fact-filled, 56-page bulletin. The most complete, authoritative publication in the industry.

ADSCO
75 YEARS OF LEADERSHIP

AMERICAN DISTRICT STEAM COMPANY, INC.
NORTH TONAWANDA, NEW YORK

PLANNED POWER PAYS

Electrical shutdowns eliminated in new Lever Brothers plant



Continuity of service is extremely vital to the processing of soap, detergent and edible oils at the new 25-million-dollar Lever Brothers plant in Los Angeles. Many operations are continuous. Even a short interruption can be costly.

Based on this factor, Bechtel Corporation, the engineers and constructors, assisted by Westinghouse, specified a secondary network system. It contains six interconnected power centers that maintain service even though a primary feeder may be faulted. Secondary faults are isolated quickly. The most complete service continuity is assured. And important, too: the initial investment was only 2% more than the *least* expensive system considered.

Careful planning has also taken full advantage of the flexibility of the network system. Future loads and additional capacity can be accommodated easily and economically.

In addition, the inherent flexibility of Westinghouse Power Centers has been utilized fully. Lower maintenance becomes a reality since these standardized units have interchangeable parts. Their Westinghouse Dry-Type Transformers allow them to be located safely anywhere in the plant.

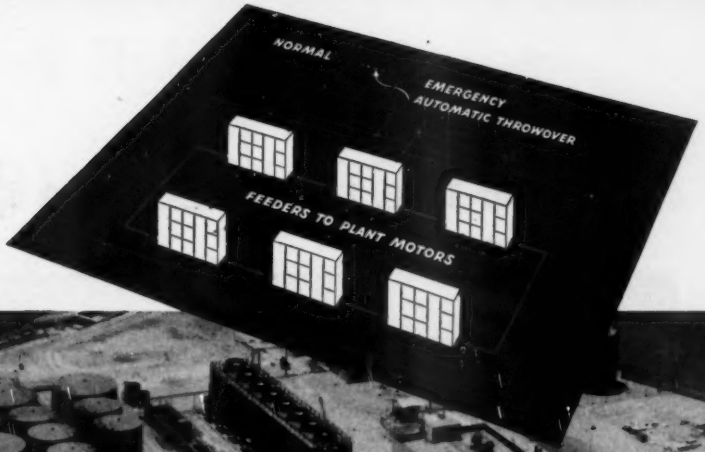
Consider this: It takes *sound planning* and *co-ordinated equipment* to provide modern distribution systems, capable of meeting your plant's power needs today and in the years ahead. Westinghouse offers you *both* . . . backed by years of experience, gained throughout all industry.

A call to your nearest Westinghouse office will bring an application engineer—well qualified to discuss your system problems with you and your engineers. Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-94953

YOU CAN BE SURE... IF IT'S

Westinghouse

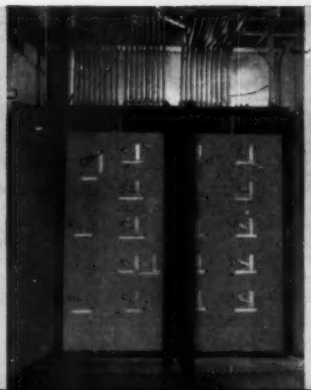
SYSTEM PLANNING



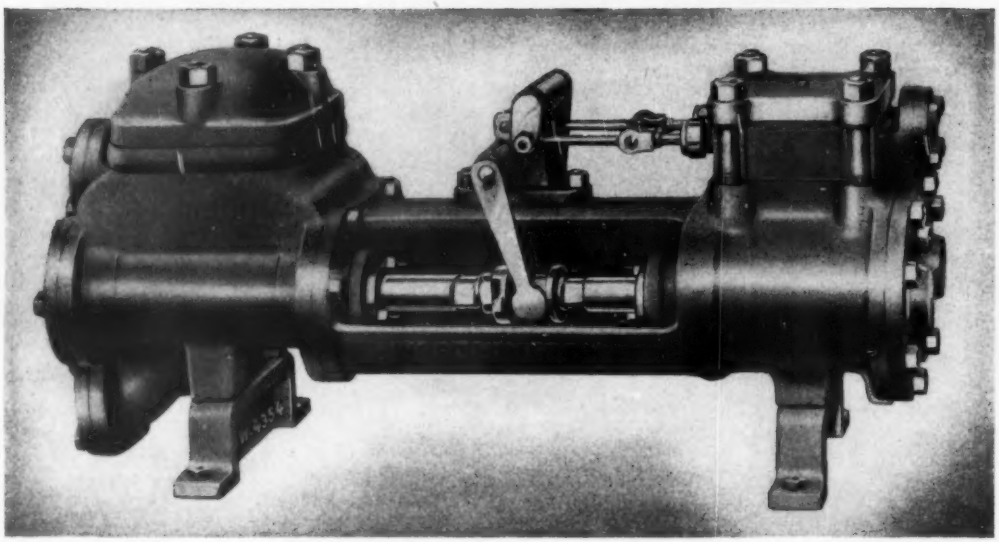
Above diagram shows two incoming sources of power which serve the main 4,160-volt Westinghouse Switchboard. Power failure on the primary source automatically throws in the emergency power.

Right: Standardized Westinghouse Power Center is interconnected with five others in the secondary network system. Complete service continuity is assured.

Left: Unitized Westinghouse Control Centers have special enclosure. This solves exposure problem during daily operation and hosing down.



This is a throttle valve



. . . And so is this!

You may think you're getting the most out of the steam in your plant—but here's an idea that's slipped by the best of them.

If your plant uses steam, you undoubtedly use throttle valves—and you undoubtedly use pumps. But have you ever considered using a pump that can do the two jobs more economically than one?

A steam pump can do just that—as a pump it pumps, and as a steam "consumer" it serves nicely as a throttle valve to reduce the pressure with only a small loss in heat energy. Big point is that it does all this on power that's otherwise wasted. THE POWER'S THERE, WHY NOT USE IT?

MODERN WORTHINGTON STEAM PUMPS OFFER YOU ALL THESE ADVANTAGES

THEY'RE FLEXIBLE because capacity can be easily varied. And exhaust steam can be used for process work or heating.

THEY'RE SIMPLE—any mechanic can operate or maintain one with ease. There's very little that can go wrong. No motors or couplings to maintain.

THEY'RE LONG-LIVED because they operate at slow speeds minimizing wear. Features: 250-pound steam end, lubricated drop forged valve gear, integral cast cradle.

For seven reasons why Worthington steam pumps lead the field, write for Bulletin W111-B13B to Worthington Corporation, Reciprocating Pump Division, Harrison, N. J.

P.2.5

The World's Broadest Line Assures You the Right Pump for Every Job

WORTHINGTON

Steam Pumps

Blackhawk Hydraulic Equipment

saves thousands of dollars

aligning jet engine saddles!

1001 similar ideas make the new BLACKHAWK IDEA BOOK a "gold mine" for you

One pump—a Blackhawk P-182 — powers all 15 Blackhawk Rams on Bell Aircraft aligner. Blackhawk Valves are also used throughout.

HERE'S what happens when idea men of industry and versatile Blackhawk hydraulic equipment team up. At Bell Aircraft, production of jet engine nacelles was slowed by a bottleneck in aligning saddles as they came from welding.

But not for long! Idea men of Bell's production engineering department—working with Blackhawk field engineers—came up with a straightener built of standard Blackhawk hydraulic components that turns out several times as much work as the former method . . . with less manpower! In the first three weeks, it saved Bell Aircraft thousands of dollars!

It's the same story in plant after plant. You see, many industrial and construction methods are today being revolutionized by Blackhawk equipment. Savings in time, money and materials are often spectacular. Safety and ease are being introduced to many jobs formerly downright dangerous and back-breaking. Yet Blackhawk equipment itself is surprisingly low in cost!

You, too, can be an Idea Man! Get your copy of the great new BLACKHAWK IDEA BOOK today. It's loaded to the margins with new uses for hydraulic tools and hand tools . . . shortcuts you'll find nowhere else.

Headquarters for the world's most complete line of hydraulic tools plus industrial hand tools.

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How to get your FREE copy of the IDEA BOOK

Ask for it from "The Man Who Knows" — your nearby Industrial Supply Distributor who represents Blackhawk. He'll be glad to give you an IDEA BOOK plus full facts on his Blackhawk products. If your distributor cannot supply the IDEA BOOK, write on your company letterhead to Blackhawk Mfg. Co., Dept. M49102, Milwaukee 1, Wisconsin.

Panel discussions on how casters help reduce the **"Reducible 30%"***

MATERIALS-HANDLING FORUM

Write us how you've used casters to solve specific handling problems. $25.00 will be paid for material used.

A SERIES PUBLISHED BY BASSICK, WORLD'S LARGEST MANUFACTURER OF CASTERS AND FLOOR PROTECTION EQUIPMENT

NEW "FLOORVEYOR" SYSTEM SUGGESTS MATERIALS-HANDLING SAVINGS FOR WAREHOUSES AND INDUSTRIAL PLANTS

Minimum manpower can move 6,000,000 lbs. of freight in 24 hours

With "Floorveyor", this can be accomplished at Central's one-tenth-of-a-mile-long main island dock that can accommodate 110 trucks at a time . . . world's largest terminal occupied by a single motor carrier.

Here each Bassick Caster-equipped truck has a locking pin that can be connected to the powered floor conveyor line.

This new method of materials-handling in industrial plants, particularly in warehouses and terminals, is attracting widespread interest and attention.

Called "Floorveyor", it permits extremely flexible use of floor trucks . . . makes materials-handling practically automatic, saving valuable labor. It is one of the thousands of ways Bassick Casters are helping to cut materials-handling costs.

Pioneers in this new technique are Texas Motor Carrier, Central Freight Lines Inc., and Philadelphia's wholesale drug distributor, Smith, Kline and French, Incorporated. Central's 47,580 sq. ft. dock (large photo, below) and the warehouse of Smith, Kline and French, Incorporated (smaller photo) both show the "Floorveyor" system . . . the trucks are equipped with Bassick Casters.

MANUAL OPERATIONS VIRTUALLY LIMITED TO LOADING AND UNLOADING

After releasing the locking pin, this worker removes the truck from "Floorveyor" and moves it manually only a short distance.

The only other manual operations were the initial loading and moving of the truck, and setting it into the "Floorveyor" . . . a great time- and labor-saving advance in materials-handling.

Trucks automatically conveyed to destination by "Floorveyor"

This worker at Central's Dallas terminal is getting ready to drop the locking pin into the "Floorveyor" channel, which will then move it to the desired point.

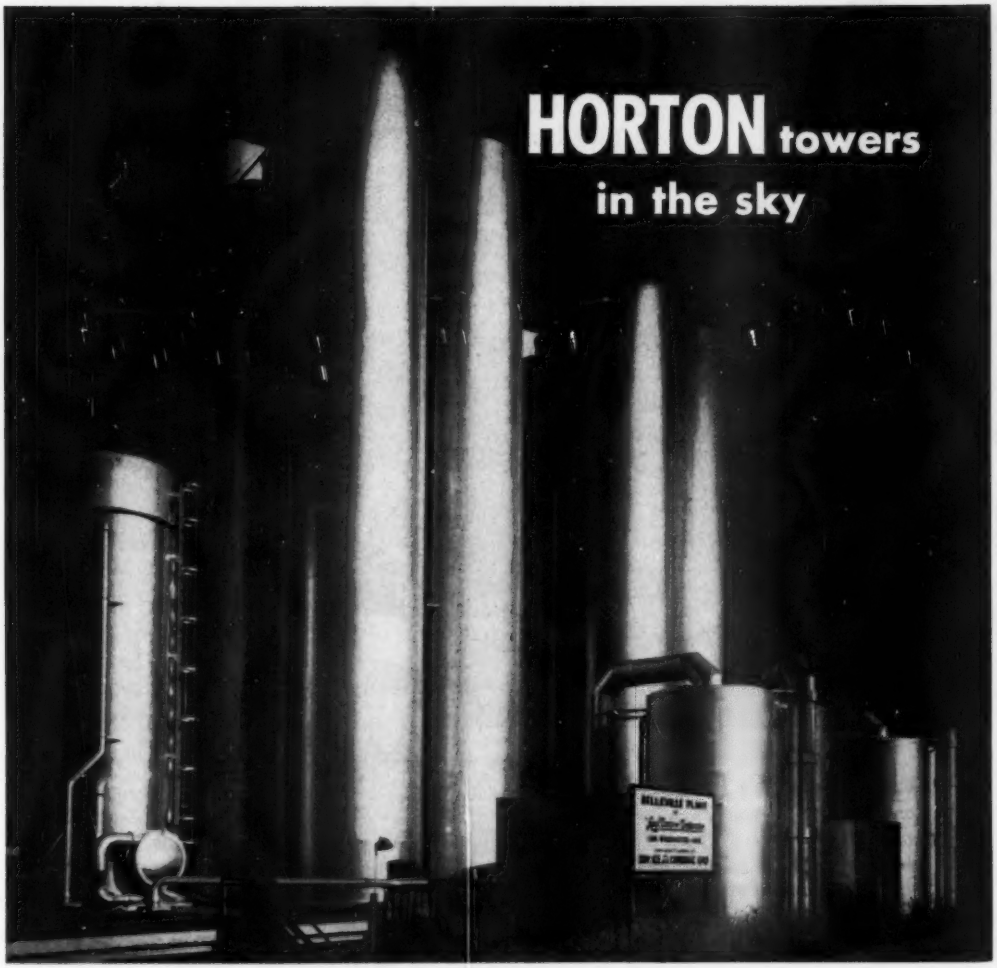
The Bassick Casters used on the trucks in Dallas have given excellent service and have been selected for use in the new Houston, Texas Terminal.

Full caster information available upon request

Write for full data on Bassick Casters, the world's largest line with the sizes and types for everything you wish to move easily, quietly, efficiently. There is a local distributor of industrial supplies in your vicinity who handles Bassick Casters, Wheels and Locks for every need. Factory engineering assistance readily available. THE BASSICK COMPANY, Bridgeport 2, Conn. *In Canada:* Belleville, Ont.

*According to cost analysts, materials-handling (about 30% of total cost) affords about the only real opportunities for cost reduction today.

Bassick
A DIVISION OF STEWART SW WARNER
MAKING MORE KINDS OF CASTERS . . . MAKING CASTERS DO MORE



help produce 75 TONS of CO_2 daily

Eight 12-ft. diam. by 100-ft. high absorber towers are helping the Liquid Carbonic Corporation's plant at Belleville, N. J., produce 75 tons of carbon dioxide gas daily. The major consumers of this liquid gas are the bottling and soda fountain industry, manufacturers of fire extinguisher equipment, and the manufacture of dry ice.

Carbon dioxide is a low-cost product. To reduce freight rates to a minimum, Liquid Carbonic Corporation has built 33 gas plants throughout the United States and Canada of which the Belleville plant is the largest.

The absorber towers at the Belleville plant were fabricated at our Greenville, Pennsylvania, plant and erected by one of our own experienced field crews. These towers are a typical example of the type steel plate structures we fabricate and erect for industrial plants of all kinds. We also design, fabricate and erect other steel plate products such as elevated tanks, flat-bottom tanks, spherical and spheroidal pressure tanks, and cylindrical pressure vessels in a complete range of standard sizes.

Further information or quotations may be obtained by writing our nearest office.

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Houston 2.....2166 C & I Life Building
Los Angeles 17.....1574 General Petroleum Building
New York 6.....3317—165 Broadway Building
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Seattle 1.....1370 Henry Building
Tulsa 3.....1669 Hunt Building
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Plants in BIRMINGHAM, CHICAGO, SALT LAKE CITY, and GREENVILLE

In Canada: HORTON STEEL WORKS, LIMITED, FORT ERIE, ONT.

steam trap trial shows how to increase production

Flat-work ironers in Pennsylvania laundry heat up in 15 min. with Yarway traps instead of previous 1½ hours.

West Coast Rubber molding plant cut heating cycle on presses from 15 minutes to 8 minutes by using Yarway traps.

Kettles in New England hospital kitchen reach cooking temperature in 12 minutes with Yarways instead of previous 25 minutes.

Southern textile mill gets satisfactory slasher production for first time due to faster heating-up with Yarway traps.

These 4 plants—each in a different industry—have something in common. Each installed a Yarway Impulse Steam Trap on a trial basis—and after witnessing the production-boosting results, they standardized on Yarway traps.

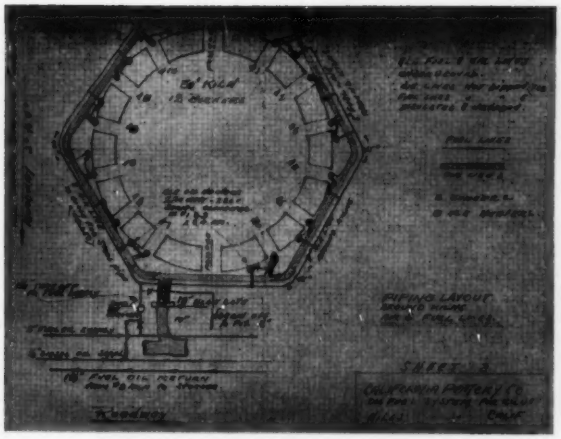
Experiences like these are found in hundreds of plants because Yarways are *designed* to get equipment *hot in a hurry*, and therefore into production fast.

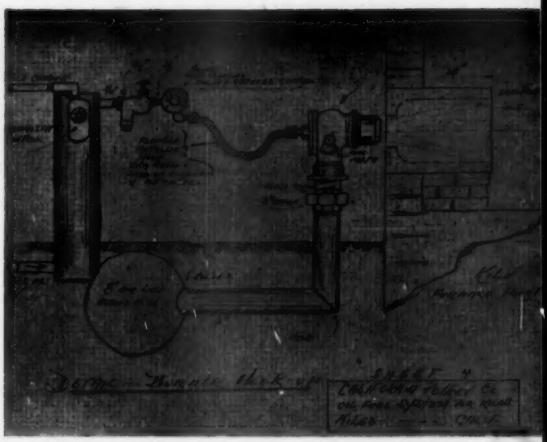
Coupled with other Yarway Impulse Steam Trap advantages like small size, easy installation, stainless steel construction, easy maintenance and low cost—it explains why more than 800,000 Yarways have already been installed.

YARWAY

the steam trap designed with more production in mind

YARNALL-WARING COMPANY •145 **MERMAID AVENUE, PHILADELPHIA 18, PA.**





From Gas to Oil in 20 Minute Change

Either lay off employees for 3 months, pay excessive overtime, or change the burner system—these were the choices . . . They designed a new burner system and now they're saving thousands of dollars

By ERNEST B. BRIDGETT, Engineer, California Pottery Co.

CHAMBER OF COMMERCE reports to the contrary, it does get cold in Niles, California, where the California Pottery Co. has been making clay products for more than 60 years. When it does, the domestic use of natural gas soars, and the Pacific Gas & Electric Co. shuts off the supply to the 108 burners in our 9 kilns, which normally consume 18,000,000 cu ft of gas per month.

Thanks to the recent installation of a flexible stand-by system which we developed, one man carrying a handful of tubes and a speed wrench can convert all twelve burners in a kiln to fuel oil in 15 or 20 minutes. And our production of clay pipe, fuel lining, drain tile, and fittings goes on without interruption.

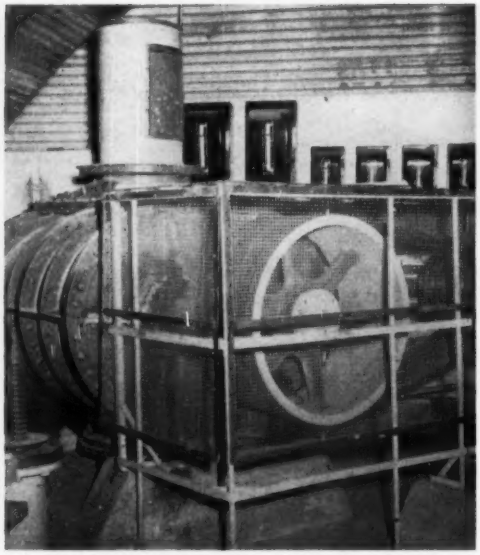
But it wasn't always that easy. When we were dependent on natural gas, and a sudden cold spell forced PG & E to interrupt our supply, we would lose all of the fuel already consumed in possibly four or five kilns and production time costing thousands of dollars. Consequently we had no choice but to shut down and lay off our 80 employees for most of every November, December, January, and part of February.

If Necessity ever mothered Invention it was here. We were losing 25 per cent of every year's production time. We had to develop an oil-burning stand-by system without duplicating our 116 gas burners. Besides the equipment cost involved, a change-over of burner bodies, pipes, and hoses from gas to oil and back to gas during every "off again, on again" cycle, would have required keeping 5 men on overtime.

The use of oil in firing kilns had not been too successful in the past because, unlike gas, oil was difficult to regulate to produce the precise and constant temperature demanded in the manufacture of clay products. Our kiln operations require an initial temperature of less than 200 F to eliminate the mechanically combined water, and this temperature must be maintained (below the boiling point) for at least 24 hours.

The same burners used for these initial fires must also be capable of burning the kilns up to a finishing heat of 2200 F. The problem, therefore, was one of securing maximum turn-downs and turn-ups of heat

Over-all view of one of the burner set-ups in the new type rectangular kiln



Above, left: Piping pit before covers were installed. Barely visible at right and parallel to side border of photo is the gas line. Large pipe above and to the left of it is the air line; photo also shows "split" in air line to each side of a bee-hive type kiln. Smaller line on the left is the oil line shown hooked up to a meter. Above, right: Positive pressure blower driven by 125 hp motor furnishes an excess of air (if needed) for all burning operations in kiln

with a single installation for either gas or oil, and to supply the 9 thirty-foot down-draft kilns, each with its 12 equally-spaced burners.

To tackle the problem we built a small test furnace and experimented with various burners and with Diesel and heavy oils. Finally we developed a system which enables us to use four different fuels in the same burners, and which gives us an oil burning temperature curve indistinguishable from that produced with gas.

Our installation consists of four major parts, each of which plays an important role in its successful operation. They are: 1. Fuel System; 2. Air System; 3. Electrical System; and 4. Burners.

Four independent fuel supply lines run in back of each kiln and are connected to them through lead-ins.

Natural Gas: We normally burn interruptable 1050 Btu surplus gas supplied at 5 psi through a 3 in. steel pipe line. Another 1-1/4 in. copper line at 5 psi supplies 1050 Btu firm gas, but as we are limited to a consumption of 750,000 cu ft of this fuel per month, it is held in reserve for initial firing of kilns before a switch to oil.

Diesel Oil: 1725 gal of Diesel oil are stored in two tanks located 10 ft ahead of the No. 1 kiln. One 1/2 in. galvanized pipe under 30 psi is connected to the fuel oil lead-in at each kiln and is valved with separate 1/2 in. valves before being connected to the line around each kiln.

A 1 hp 110/220 volt motor driving a Roper rotary pump circulates the Diesel oil. A horizontal check valve is installed up stream from the pump, and a pressure regulating valve is also installed on the pump connection with return to the tank. Piping is duplicated to each tank so that either or both may be used. No heat is applied to Diesel oil.

Fuel Oil: Two interconnected underground concrete tanks with capacities of 20,700 and 40,000 gal stores the heavy fuel oil. The supply line is 2 in. steel pipe, hot asphalt dipped and wrapped. The return line from the last (No. 9) kiln is 1-1/2 in. pipe, waterproofed in the same manner.

Fuel oil, heated to 140 F by 50 psi steam and controlled by a Fulton Sylphon regulator, is drawn from tank No. 1 through a Hauck No. 10A suction heater at a line pressure of 45-50 psi. One Hauck duplex filter is connected ahead of a Roper, model K-15 pump driven by a 2 hp 220/440 volt, 3-phase motor. Under our conditions this pump circulates the heavy oil at up to 12-1/2 gpm.

Fuel oil is led into each kiln through a Hauck single filter, and pipe size is reduced to 1 in. A 1 in. shut-off is installed ahead of the filter. Before the oil enters each burner it is heated to 190-200 F in a thermostatically controlled 2500 watt Chromalox electric heater. The Hauck valve and strainer combination furnished with the No. 581 burner is connected next to this heater. A 3/8 in. Hauck micro-valve is coupled to the hose leading to the burner. This micro-valve is capable of maintaining a constant flow of oil regardless of oil temperature. Previously, when needle valves were used it took two men to regulate the temperature of one kiln; now one man can handle six at once.

A main steam line is connected to the 2 in. supply line and is valved so that steam can be used to force residue oil back to the storage tanks when it is necessary to shut down or to change to gas. Steam is also used to heat the lines prior to starting in cold weather.

Just before burning off a kiln, the fuel oil is shut off and the Diesel oil is introduced to the lines, forcing remaining fuel oil out through the burners. When Diesel oil reaches all burners then that kiln is shut down. Thus, the lighter Diesel oil

(Continued on page 190)

Ultimate installation with assembly of gas and oil tubes in one unit. Left, electric heater with thermostat; in the center, shut-off, strainer valve and micro-valve connected to flexible hose

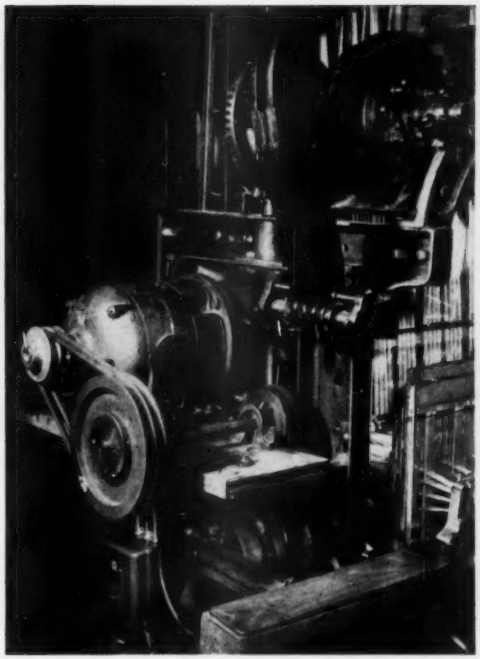
Brake Motors Step Up Production Improve Quality, Too

ZIPPER TAPE must be made to rigid specifications and the William T. Carson Co., Philadelphia, previously vexed by a production problem, had to find a way to improve the quality of this product. They found it and saved money while doing it.

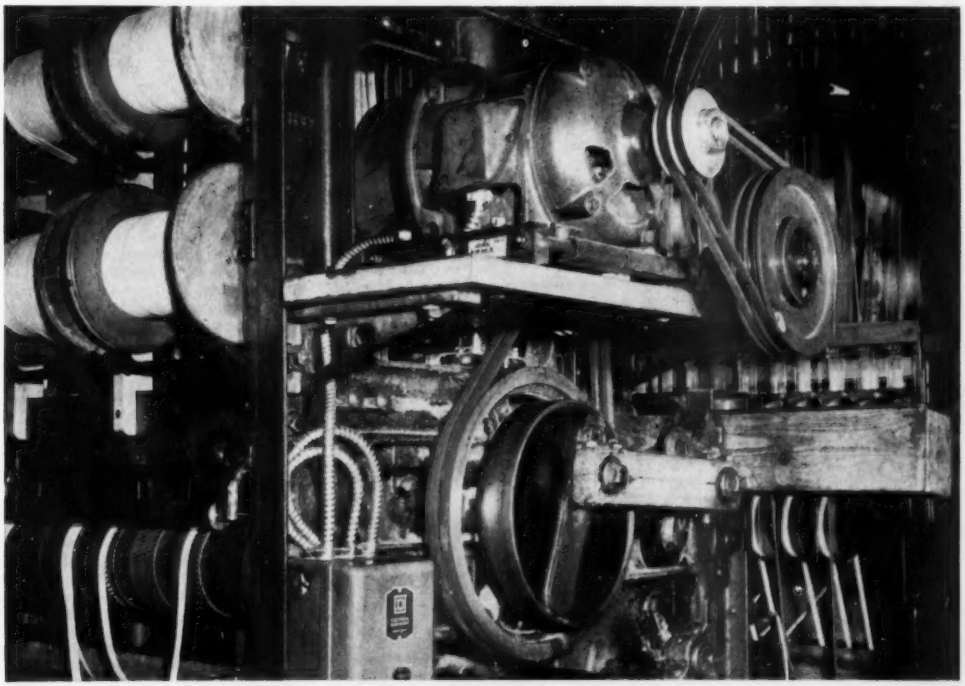
When the looms coast to a stop—in four or five revolutions—there are produced what are called "stop marks" or loosely woven sections; these must be cut from the tape. Industrial Distributors Lindsay, Oberholzer & Company worked with the Carson engineers and the accompanying photos show how the converted looms appeared after the change.

A major factor was the installation of 1-hp Crocker-Wheeler brake motor which now stops the loom in less than one revolution instead of the four or five previously necessary. Another feature of the new installation was the application of a two-step V-belt drive which has resulted in longer belt life.

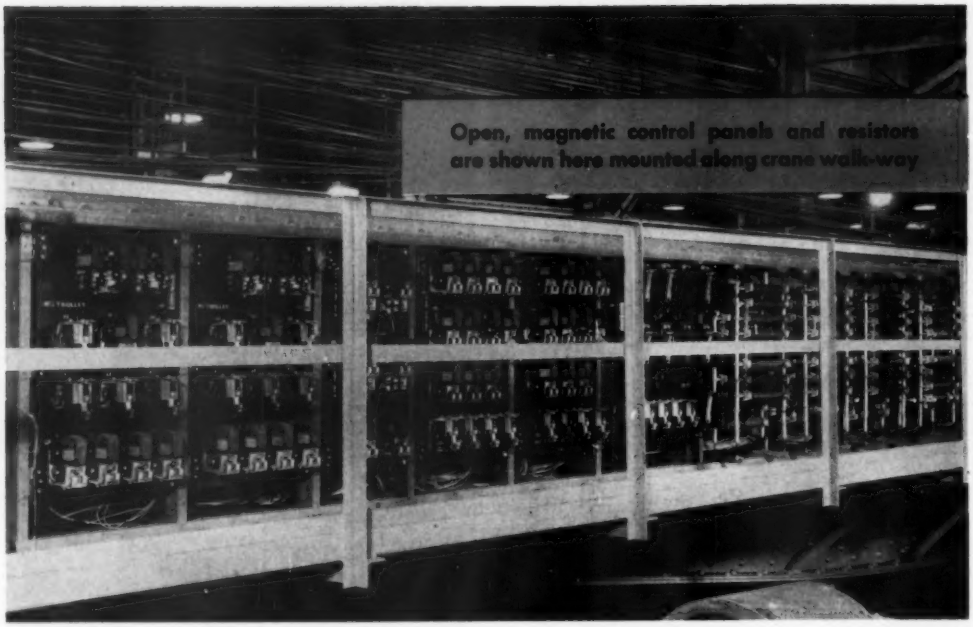
According to company executives the cost of the new equipment amounted to about $200.00 per loom. But the savings amount to more than $500.00 per loom per year. Plus better quality tape.



Installation of 1 hp brakemotor on a narrow fabric loom



Formerly, machines making "zipper" tape, coasted to a stop, causing imperfections called "stop-marks." These have been eliminated with the brake motor installations shown on this page. Changes cost $200.00 per loom; save $500.00

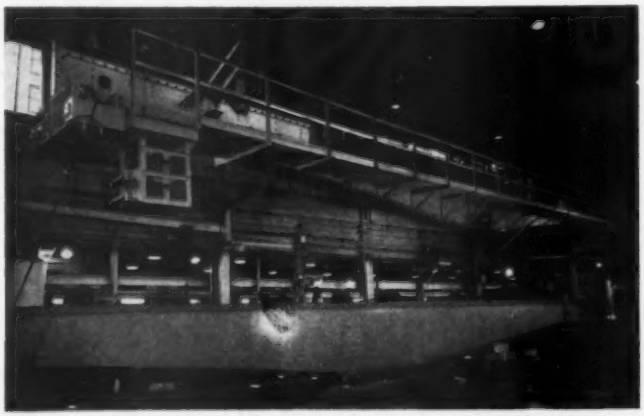


Open, magnetic control panels and resistors are shown here mounted along crane walk-way

Is That Overhead Crane Safe?

By CLARK B. RISLER, Industry Engineering Dept., Westinghouse Electric Corp.

ACCORDING to the last year-long survey made by the National Safety Council, there were in Pennsylvania alone, 633 compensable injuries directly traceable to overhead crane operations. Of this number, 265 accidents, including eight fatal, occurred on traveling cranes (overhead and gantry). Although no national figures are available for a similar period, its is logical to assume that the injury count would have been in the several thousands. According to the National Safety Council, hoisting equipment accidents are second in importance only to machinery accidents in the steel, machinery, and construction industries. Because of the over-all seriousness of crane accidents, a study of every phase of crane operation should be included in any industrial safety or accident prevention program. And one of the most important phases is the equipment used to operate the crane.

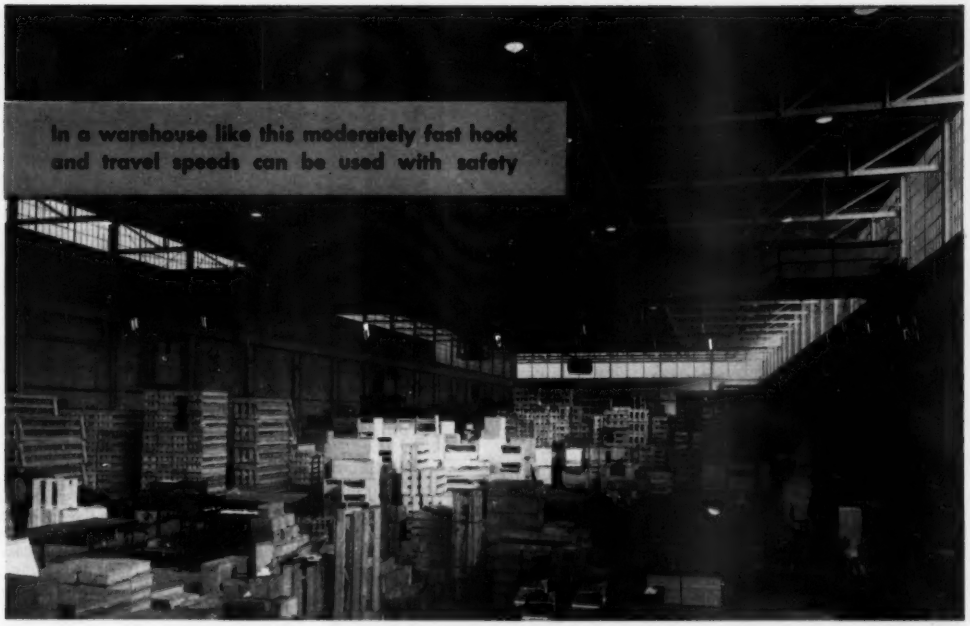


Crane in process of erection. Special platform at rear end provides safe access to main collector system. Trolley collector system above girder for ready access

Traveling cranes are powered almost exclusively by electricity because no other prime source of energy is as well suited as electric power. Therefore, the safety considerations pertaining to the electrical equipment are of prime importance in the over-all consideration of safe operation of overhead cranes.

Generally, these electrical safety considerations can be divided into three categories: 1—design; 2—performance; 3—maintenance.

If an overhead crane is to handle loads safely, it must be adequately powered. The motor is the muscle of the crane and should be selected to handle the rated loads for which the crane structure is designed without being overloaded. If alternating current power is available,



In a warehouse like this moderately fast hook and travel speeds can be used with safety

Design, performance and maintenance all contribute to the safety, or lack of it, of overhead cranes . . . Here the author tells about basic features that should be observed

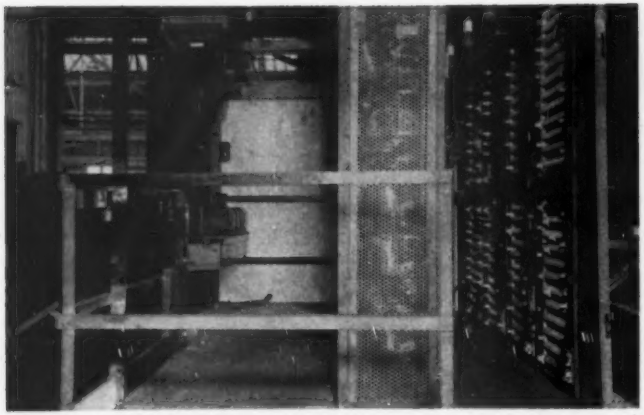
wound rotor motors are used, thus providing fixed full speed during hoisting and lowering of all loads. If direct-current power is available, series motors would be used, with their inherent advantages of low-speed hoisting of heavy loads, high-speed hoisting of light loads, and a fine degree of control.

To be safe, a motor must have a rugged design for frequent reversing duty, must be simply built and must be well braced for possible overspeed operation. It should be capable of 150 per cent overspeed if it is an a-c motor, and more than this if it is a d-c series type motor. A good example of the latter is the mill-type d-c motor designed for heavy duty service in steel mills and used widely on d-c cranes in general industry.

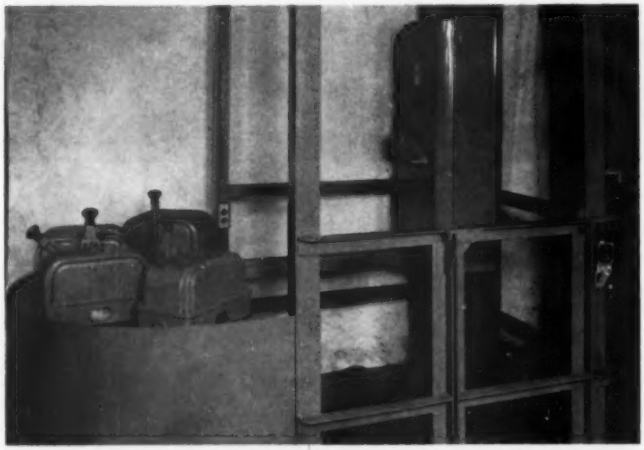
For ultimate safety, especially in hoisting duty, the brakes should offer the utmost in reliability. Crane hoist controls, both alternating- and direct-current, are designed so the brakes are applied if everything else fails. The brakes should be easy to adjust and capable of retaining the adjustment over reasonably long periods of operation.

For hoist operations the brake should be of the spring-set electrically-released type and should be applied in such rating and quantity as suits the power and safety requirements of the individual crane. In general, a brake rating of 150 per

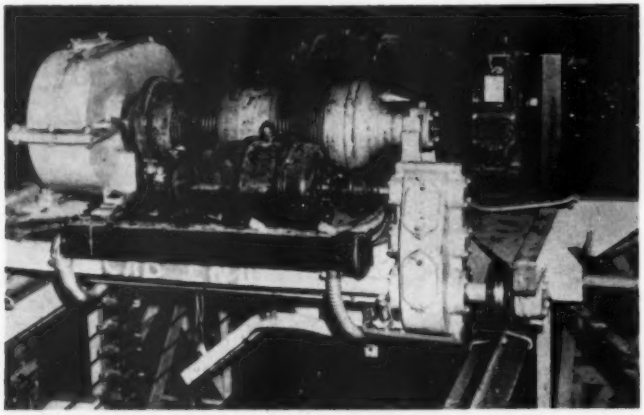
Operators' cab with control panels and resistors mounted in rear of cab behind protective screen. Master switch and main breaker located over operator's head



Cab with foot-operated hydraulic brake located convenient to operator's station



Cab arrangement offering master switches convenient to operator, emergency stop and reset button at his immediate right and circuit breaker directly behind.



Trolley of a-c crane powered by wound-rotor motors. There are brakes on both hoist and trolley motor shafts. Note lever for operating hoist limit switch

cent of required motor hoisting-torque is used. Some users apply two brakes as a minimum on all cranes, while others apply two brakes up to a rating of approximately 50 tons and three brakes for all ratings above this. There is merit in having a back-up brake on a shaft other than the motor shaft to protect both against failure of a high-speed pinion or shaft.

For bridge travel, a brake is required to serve as both a holding and a retarding device. It must hold the bridge against possible wind load if it is an outside crane and, at the same time, it must be able to apply torque carefully to prevent wheel slippage or swinging of the loads when retarding bridge travel. A brake adequately suited to these purposes is the hydraulic brake that is foot-operated from the operator's cab much in the manner of an automobile brake. In one form, these brakes are entirely hydraulically operated. In the second form, known as the electro-hydraulic brake, the brake is automatically set in case of power failure or when power is disconnected from the crane for parking.

The control equipment of the crane is the nerve system transmitting the wishes of the operator. Reliable, proven components (relays, interlocks, limit switches) in well-designed control systems are the basic ingredients of safe operation. A good control system should have a minimum of interlocks and relays, the simplest possible circuits, ample overload protection, and should have "fail-safe" characteristics. Thus, a failure should shut down the crane, set the brake, and provide, where possible, back-up protection to lower the load under dynamic braking control. These features can be determined from the literature presented by the control manufacturer.

As an essential safety requirement, a main disconnect device should be located at the power-input point on the crane. It should be within easy reach of the operator, and should be either a safety switch or a circuit breaker. Practice varies in industrial plants. Some use a circuit breaker that has automatic tripping and ready resetting, while others use a fused safety switch which has less flexible control of the tripping characteristics but has the advantage of visible indication of the open circuit.

For safe operation, the operator should have unobstructed vision of the area in which he is handling the load and should have the master switch or drum controller handle within easy reach. The arrangement of master switches should be the same for all cranes in a particular plant to facilitate interchange of operators.

Another good safety feature is an interlock that prevents operation of the crane as long as the cab gate is

open. This switch is placed in the control circuit of the main line contactor, and opening the gate has the same result as pushing the "Stop" button.

When selecting master switches, it might be well to consider the "dead man" feature. Controllers can be arranged so that the operator must either depress the switch on the master control device or stand on a button in order to permit operation. Such devices frequently cause operator fatigue or impatience, and unless they are carefully policed are often bypassed, thus cancelling out the safety characteristic.

Perhaps a better solution is the use of spring-return master switches that return to the "Off" position when released by the operator. However, these have the disadvantage of limiting an operator to two motions at any one time. Under any conditions, low voltage protection should be designed into the control equipment to require resetting of the main line contactor and the centering of all master switches before crane motion can be started after interruption of power or an emergency stop.

Limit switches, operated by the hook block, are almost universally applied to the hoist motions for "up" overtravel protection. They fall into two main categories—the shunt and the series types.

The shunt-type limit switch opens a control circuit that makes the low voltage relay shut down the drive and set the brakes. The series-type limit switch actually interrupts power to the motor and establishes a circuit with dynamic braking resistors. This is regarded as a somewhat more positive approach to the problem but is more costly.

If subject to frequent use, the series-type limit switch may require more maintenance attention. The question is whether the shunt-type limit switch, which places its dependence on subsequent operation of the low voltage relay, is of greater safety than the series-type limit switch that operates directly in the motor circuit.

Limit switches are not universally used for crane travel drives. The stops available at either end of travel, the crane bumpers, and the operators' judgment have been relied upon instead. To try to apply limit switch devices to prevent the possible engagement of cranes is an involved task. Some use of photoelectric devices has been made for this purpose.

If the control is located in the rear of the operator's cab, some type of enclosure is essential. The choice lies between the NEMA I sheet metal enclosure—as provided by the control manufacturer—and the use of a protective screen of expanded metal usually provided by the crane builder. From the safety standpoint, there is really little to choose between the two enclosures, and the one which offers the most convenient arrangement in the cab and best access for maintenance and inspection is the one which should be used.

If the control equipment is located along the crane girder there is little occasion for anybody to be up there except on maintenance or inspection duty, so open control is generally permitted. However, operating conditions such as excessive dust or exposure to the elements would dictate the use of enclosed controllers. The open control permits easy access to the panels for complete maintenance and repair, and is essential to both safe and adequate maintenance.

Two collector systems are used to transmit electrical energy to the traveling crane and from the crane bridge to the trolley. Adequate spacing and insulation of the collectors to prevent flash-over or grounding is essential. The use of double shoes or double wheels where the continuity of a circuit is essential to safety is a "must." Such a circuit would be one supplying a magnet operating from the crane.

Collector systems should be safely accessible. Cross-crane collectors can be located above the girder and a platform suspended below the crane walk-way and reached through a trap door in the walkway will permit this safe access to the main collectors and rails.

One of the prime factors contributing to safe performance of an overhead traveling crane is the selection of proper hook speed. Attention should be given not only to the rated or heavy loads carried by the

Two shunt-type hoist limit switches mounted on disassembled trolleys provide double protection. The counterweights suspended along hoist cables will be successively contacted by the hook block to trip the limit switches

Interlocking switch on gate prevents operation of crane unless gate is closed

crane but also to the performance of the hook under light loads and empty hook conditions. Both hoisting and travel operations should be considered. A relatively high hook speed will be used on a warehouse crane where extreme accuracy in spotting the load is not required. On the other hand, a machine shop crane used for assembly work requires slow speed for safe operation. The determination of the proper hook speed is the function of the machinery design as determined by the crane builder and the characteristics of the electrical control as determined by electrical manufacturer.

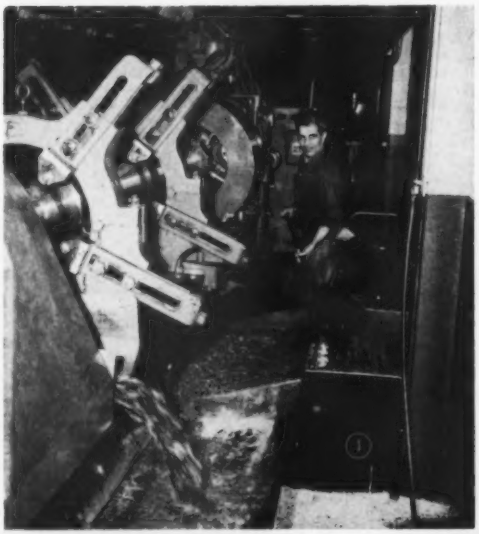
For plants with direct current power, electrical manufacturers offer crane control systems of standard design. These circuits differ on minor points but in general offer the same performance features of dynamic braking-lowering, hoisting with series motors, and reversing-plugging control of the trolley and bridge travel. Where a-c power is available, adequate crane drive can be secured for every application. Great strides have been made in the development of alternating current crane control in the last ten years. All these circuits have been designed with the safety requirements of material handling in mind. However, because of the number of a-c controls available care should be taken to select the proper one.

Essential to safety of overhead crane operation is an effective preventive maintenance program.

First, an effective program to promote safety should include a regularly scheduled inspection with authority vested in the inspectors to shut down the equipment if any conditions threatening the safety of operation are discovered. Second, the inspection should be backed up by repair and maintenance by well-trained personnel. And third, the program should include keeping of records of maintenance requirements to help in finding weak spots.

Safe and Clean Around Big Lathe

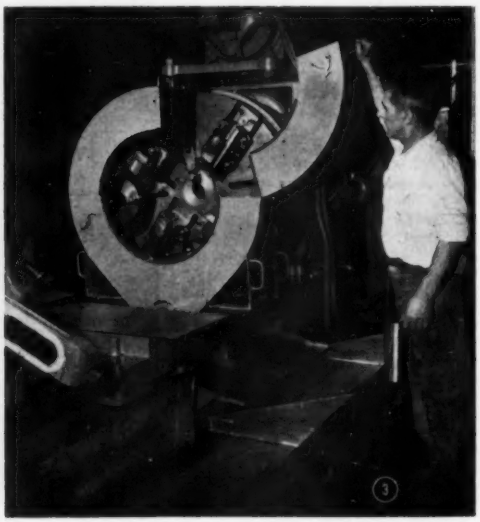
Cleveland Pneumatic Tool Co. currently is manufacturing numbers of Aerol landing gears for use on Consolidated-Vultee B-36 bombers. Size of the columns of these gears calls for large machining operations, and necessitates special measures for handling chips and for safeguarding machinists.



1—This Niles lathe turns out many pounds of chips and turnings daily in operation. Note sheet metal pans along lathe bed for easy handling of chips and coolant. Sieve-like bottom of pan allows coolant to go into reservoir.

2—Special hand truck, right, and hole-bottomed shovel that allows coolant to drain from chips and thereby speed handling job. Sawdust is for drippings, to aid workers' safety, and sheetmetal guard, shown open, also protects machinist and others from possible flying parts.

3—Another view of same or similar lathe at Cleveland Pneumatic, with sheet metal guard around counterbalanced face plate being adjusted. Note fabrication details of oil pan, bottom of photo, as well as guard components.



Jigs Built with Standard Units Are Paying Dividends On Small Runs

Many industrialists are turning to standard units to set up jigs for small runs . . . In a period of 5 months, De Havilland has constructed and used well over 100 fixtures . . . Several examples show just how these standard units are paying dividends for this English firm

LEADING British and United States industrialists are showing a great deal of interest in the novel system of building up jigs and fixtures from a set of standard units or elements.

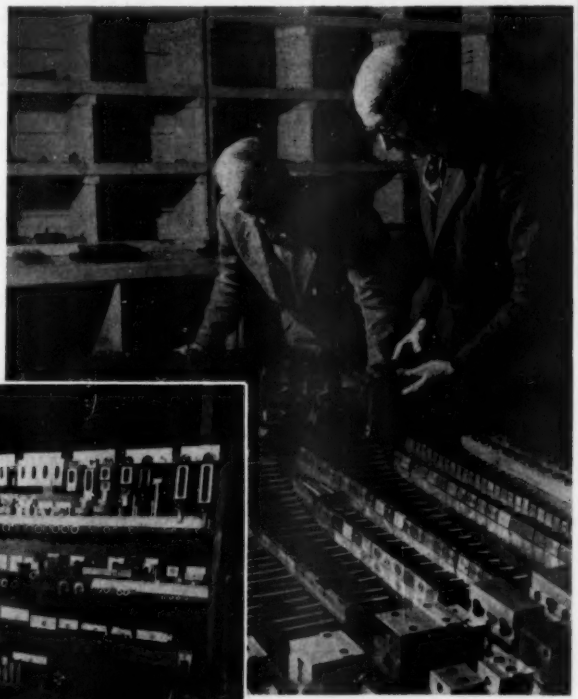
One of the English firms which has been using this system for some time is De Havilland Propellers Ltd., Hatfield. In 5 months, the company has constructed and used well over 100 fixtures.

The system consists of a basic set of some 450 units, each individual jig or fixture being built up from appropriate units in the set. It is possible to assemble a normal set-up in about a half hour.

The system is suitable, primarily, for small quantity production, since it enables jigs and fixtures to be assembled for small runs. It is ideally suited for the small quantity producer who would normally find the conventional type of jig or fixture an uneconomical proposition for limited runs. With the use of this equipment, the small producer has the added advantage of having the facilities at hand equivalent to permanent jigs. In addition, interchangeability of the product is possible.

With this system, it is unnecessary for the company to mark off and set up the component on the machine table. The use of the built-up jigs and fixtures also eliminates the setting-up time on machines. On small runs, this represents a large proportion of the total hours worked with consequent reduction in the number of machine tools required for a given output.

The accuracy of the built-up fixture is sufficient to eliminate the need for employing skilled crafts-



Left: Here is how the standard units are arranged at De Havilland. With this equipment it is possible to set up many different jigs or fixtures. Above: Men set up jig for special operation

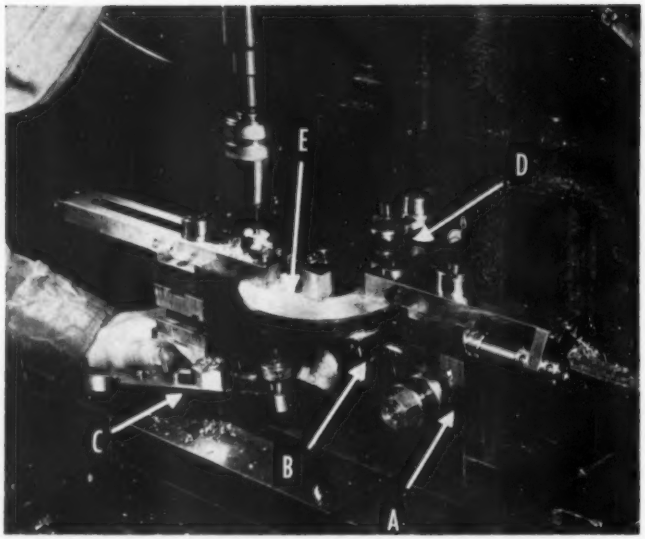
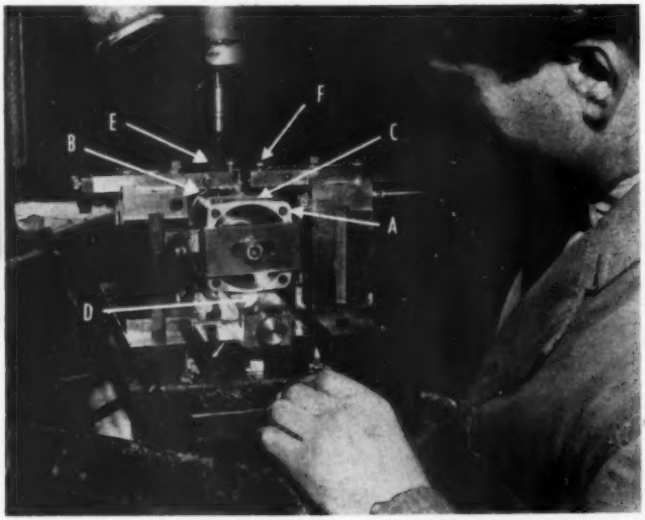


Illustration shows drilling and reaming operation of 2 holes, 13/64 in. These holes were 20 deg, round from the center-line, and had to be held to 0.00025 in., on pitch circle diameter, and serve as location holes for all subsequent operations. Standard units were used, except for the design of a special locator, shown as E. Setting piece A is spring loaded, and locates against boss B, on its center-line. Clamping is effected from the base on one side, shown as C, and by means of clamp D, against the flange on the other side. On completion of the drilling operation, the assembly is transferred to the right for the reaming operation



First, 4 tight-limit holes are drilled in the casting A. These holes are 13/64 in., and have to be held to within 0.002 in., on centers. For this operation, the component was located horizontally. The spigot, shown as B—specially turned for this operation by de Havilland—is employed to locate the bore, using another built-up jig. For drilling holes in each side pad C and D, the drill bush, E, is simply transferred from position E, after first hole is drilled, to position F, for drilling the second hole. The component is then turned over and a similar procedure is carried out on other side pad, D. (In this and the illustration above guard on drill spindle, chuck and drill was removed for photographic purposes)

men using hand methods, or the use of high precision machine tools, such as jig borers. A more important advantage of this system is that jig borers can be released for other work.

Large Batch Production

In many cases, the units have been used economically even for relatively large batch production. Production runs up to 1,000 are possible, and the fixture can be built in less time than it would take a jig and tool designer to put the design of a permanent jig on the drawing board.

Another application of the units is for receiver-type gauges, particularly for components that require the maintenance of accurate dimensional relationships in different planes. It is possible to develop and erect a gauge in very little time, and such gauges can be used economically for even very small quantities.

The De Havilland set-ups briefly described are typical of the type of fixture for which the system is commonly used. However, considerably more complicated set-ups can be developed.

The system, for instance, also provides for complete angular and compound angular machining. A special indexing device and also the use of hinged clamps allow for drilling to close centers. Another arrangement allows for circular pitch drilling, and units are available for turning. Various types of base can be provided, either to give additional area, or, conversely, to provide a lighter set-up for operations on smaller components.

Highly Accurate

It might be doubted whether such a system, comprising as it does a series of built-up elements, could provide the accuracy and rigidity required for machining fixtures. The basis of design, however, is such that high accuracy is obtained and complete rigidity is provided. Wearing parts are of nickel chrome. Manufacturing tolerances are of the order of 0.0003 in., on all principal dimensions. Correct alignment, combined with rigidity within the structure, is obtained by tenoning.

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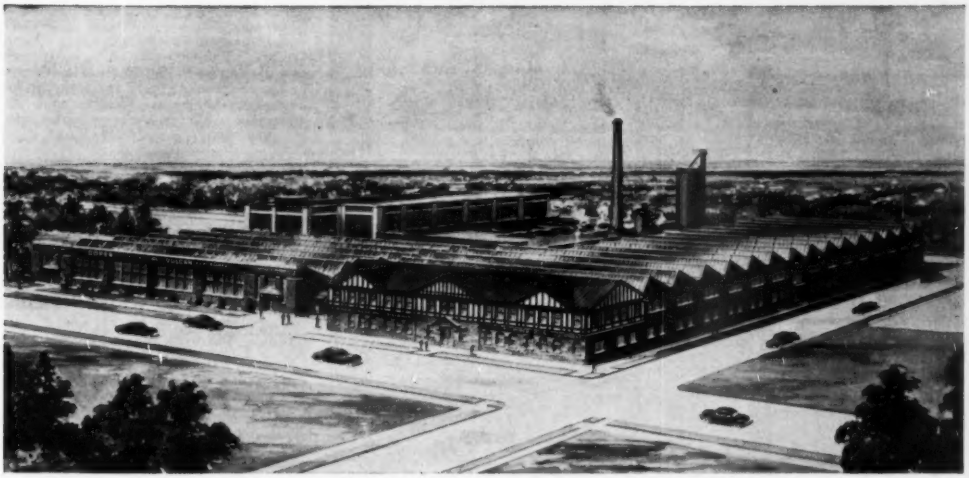
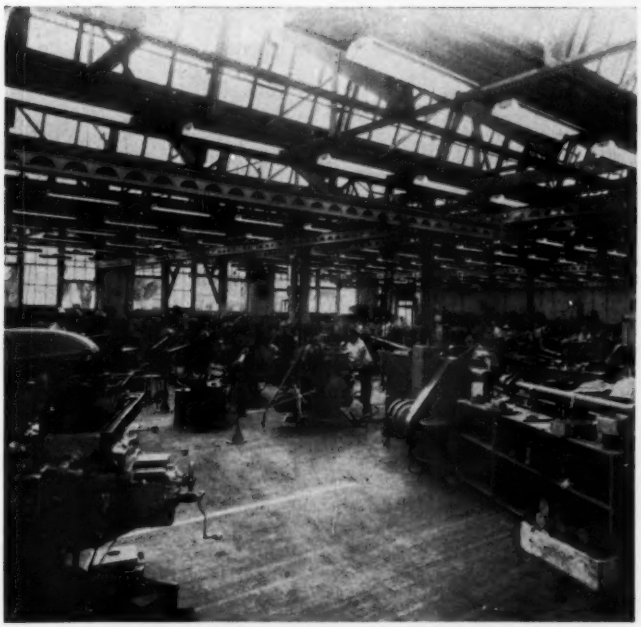


Plant Layout Engineered to the Product at Copes-Vulcan

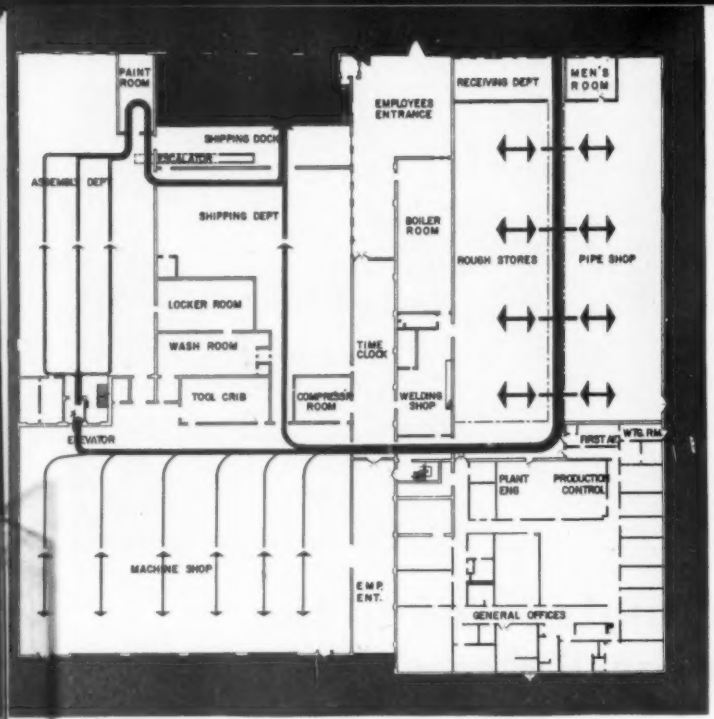
New plant layout devised for economical manufacture of two lines of products formerly made in two separate plants . . . Efficient material flow achieved by good planning but without major upset to physical features of the old plant . . . Air conditioning, modern lighting added



IN JUNE, 1952, the Copes-Vulcan Division of Continental Foundry & Machine Company was formed. Made up of two formerly independent power equipment manufacturers — Northern Equipment Company and the Vulcan Soot Blower Company — the newly-formed Division required expanded facilities, more economical plant layout and better facilities for engineering, production, service and sales. The last four have been made possible through the merger itself; the first two have been brought about through the physical features of the Division's new plant in Erie, Pennsylvania.

A major problem facing management and the plant engineering department in plant layout was the economical processing and handling of raw materials which would eventually terminate in dissimilar finished products. It is apparent, from the accompanying flow diagram, that the goal was attained with a maximum of engineering brainpower and a minimum of upset to the established basic plan of the plant (formerly the property of Talon, Inc., manufacturers of zippered closures).

Uncluttered aisles of machine shop give workmen plenty of room for handling of sometimes awkward lengths of stock



Flow diagram of materials in-storage and in-process at Copes-Vulcan. When finished parts leave machine shop they can be moved to finished parts storage in basement or directly to assembly department. While its part in flow of materials is not shown on diagram, the escalator between the basement and the shipping dock saves long, out-of-the-way trips between these two points

All incoming raw material passes from the receiving department—upper right in flow diagram—into its proper location in rough stores. From this point some of the material goes directly to the machine shop; other material is processed at various machines in the pipe shop before being passed along for final operations in the machine shop. Still a third type of product is completely finished in the pipe shop and goes from there directly to the shipping department. Generally, these are soot blower lances and elements which require no machine shop work.

Two-Way Elevator

When the material reaches the machine shop it is routed to the proper machine tools, is finished and placed on the elevator to be taken to finished parts stores in the basement. The same elevator, which has two-way exit and entrance, brings parts as needed to the head of the assembly department. Here there are three assembly lines, as shown on the flow diagram, and the parts are routed to the lines as needed. The assembled material then passes through the paint room and out to the shipping room to be crated or boxed, and then to the shipping dock.

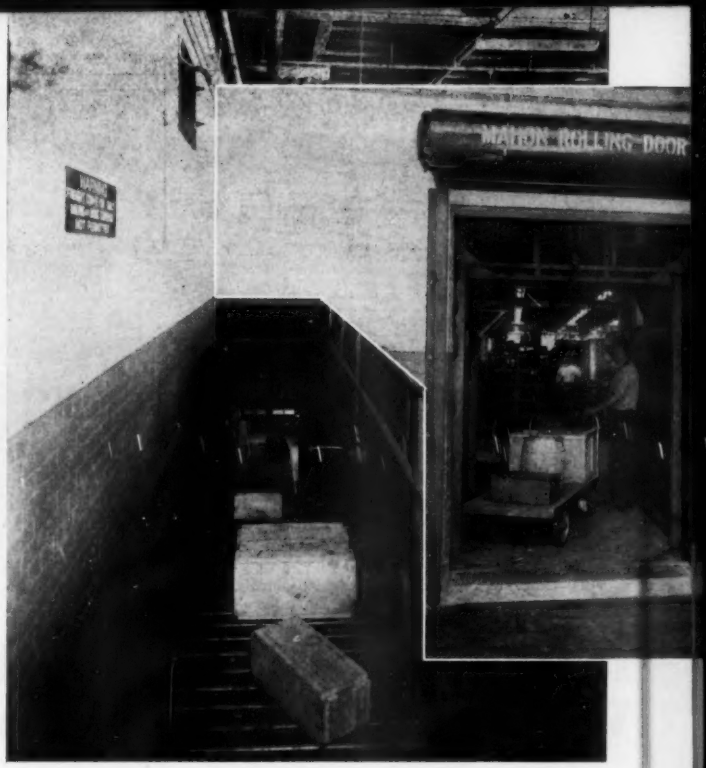
Previous owners of the plant, Talon, Inc., were to a great extent in the consumer field. It follows, therefore, that their need for an engineering department was of considerably less magnitude than that of Copes-Vulcan Division, much of whose equipment is engineered for specific installations. This factor, plus the need for general office quarters, necessitated the addition of several thousand square feet of office space.

Space for the engineering department was found on the second floor of the plant directly over the general office space. Construction of this part of the building was typically industrial when the plant was taken over by Copes-Vulcan. As shown by the photograph of the research and testing department, the utility lines were exposed under open sawtooth construction. Weight-bearing members were of heavy timber construction. All of which was hardly in keeping with modern office appearance, lighting, layout, or comfort.

As have many plant planners before them, Copes-Vulvan found that a suspended, acoustic ceiling solved more than one problem and, at the same time, permitted utmost application of modern office planning principles.

First, this type of construction covered the unsightly utility lines and open roof and skylights. Second, the suspended ceiling offered a practical method of eliminating the not-so-sightly open construction and made more practical the complete air conditioning of all office space and, at the same time, provided an uncramped space for the installation of air conditioning ducts. Incidentally, two Carrier air condition-

Research and testing department are located in background. Plant, as it stood, was of basically sound construction. At rear and sides of camera location is area where plant cafeteria is to be installed. Note typical industrial construction and compare this view with photo of the offices opposite



At far right is view of newly constructed elevator door with redesigned elevator; these construction changes permit faster materials handling between machine shop and finished parts storage. New escalator is shown in other photo. Safety control consisting of electrical interlock plus savings in travel time are big features of this new piece of Copes-Vulcan construction

ing units of 55 tons total capacity are installed.

As for lighting in office areas: seven different types of fluorescent fixtures were specified, all of them to use 4500 degree white lamps with high power factor ballasts and no-blink starters. Spacing and hanging of the fixtures was varied to give desired intensity of lighting.

Two comparatively minor changes in the plant structure have resulted in major economies in material handling. As the plant originally was laid out the elevator — between the machine shop and the assembly department — had but one exit and entrance; this faced what is now the assembly department. By the rather simple expedient of cutting an entrance to the elevator shaft through the machine shop wall (and also by adapting the elevator to the change) considerable material handling and resulting traffic jams have been avoided.

Of even greater significance in time and money-saving is the escalator traveling between the loading dock on the first floor and the finished parts stores department. Prior to the installation of the escalator it was necessary, when material was moved from finished parts storage to the shipping docks, to load it on trucks, move it to the elevator, up to the first floor and then, by a circuitous route, to the shipping dock. Now materials or products can be moved directly between these points.

The safety of employees always has been of prime importance to the management of Copes-Vulcan. This has been manifested in many ways but, in the case of the escalator just described, an interlocking arrangement of switches makes it impossible for a single employee to move the escalator. One man must be in attendance at the foot of the incline holding closed an actuating switch; his counterpart must be stationed at the top of the escalator closing the circuit at that end.

Wash and Locker Rooms

Sanitary facilities and locker rooms at Copes-Vulcan are unexcelled, even by larger plants. Two previously cluttered areas which served similar functions, including a small canteen and women's toilet, were cleared out. Space-saving wash fountains were installed for wash-up; tile walls and power-floated concrete floors were put in for good sanitation; new lockers were installed for employee comfort and convenience.

It is a corollary that improved products and greater efficiency follow good plant layout and better engineering. Copes-Vulcan Division is proving that these necessary adjuncts to doing business today can well be accomplished along with good employee relations, worker comfort plus an attractive plant.

One view of the engineering department and drafting room. When Copes-Vulcan took over the plant this portion was an extension of that shown in photograph on opposite page. Suspended acoustical ceiling, planned lighting, covered columns, private offices and refinished floors have appreciably altered the appearance of the area

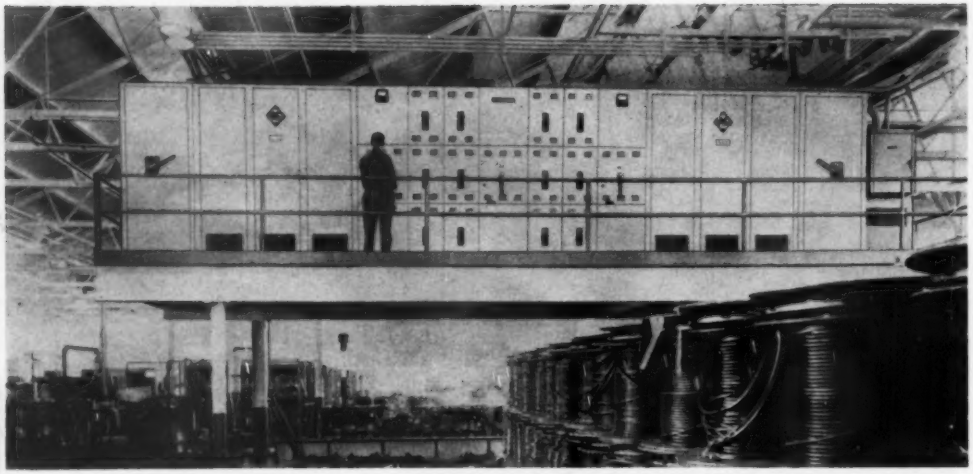


Fig. 1. This is a typical balcony installation of a double ended, load center substation with two 1000 kva dry-type transformers. Continuity of plant electric service during normal maintenance checks is well assured with this type of installation

DOUBLE-ENDED SUBSTATIONS — When Are They Worth the Price?

The extra reliability afforded by these units may be worth what it costs you, but first, investigate what they can give you in added value for the extra money involved.

By J. V. McGUIRE, Manager, Unit Substation Section, Allis-Chalmers Mfg. Co.

DOUBLE-ENDED UNIT SUBSTATIONS have found wide application in industrial plants requiring a highly reliable power supply. With double-ended substations, maintenance, inspection and testing of transformers, primary equipment and low voltage breakers can be done without power interruption.

There are many plants, however, where a short shut-down for maintenance can be tolerated without loss or inconvenience. The use of double-ended substations in such plants adds thousands of dollars of unnecessary expense.

The double-ended unit substation is one having two transformers feeding two sections of low voltage switch-gear separated by a normally open tie breaker. Figure 1 shows the most common arrangement of a double-ended unit substation. The single line diagram of such a unit is shown in Fig. 2.

A double-ended substation may have two separate units installed face to face with a common operating aisle and with a low voltage bus run tying the two units together. In other cases two units are located some distance apart and tied together by lengths of low voltage cable. In each case the one line diagram is essentially that shown in Fig. 2. Double-ended unit substations usually are specified in an attempt to increase the reliability of the unit.

How is reliability increased? The double-ended unit substation provides emergency service for two basic failures: 1. Failure of one transformer. 2. Failure of one incoming line.

In case of either type of failure, the operator must manually trip the transformer secondary breaker on the faulted side of the substation and then manually close the tie breaker. The second transformer then takes over the load of the entire substation. Such an operation requires that: 1. An outage must be tolerated from the time of failure until the load is picked up manually. 2. Each transformer must be equipped to carry the total load of the station. This usually means oversize transformers plus fans or 3. Some load must be dropped during emergency operation.

To provide service despite the failure of the primary line feeding one transformer there is the additional requirement that the opposite ends of the substation be fed from two separate high voltage cables.

At first, these provisions for emergency service may sound like fairly good recommendations for the double-ended unit. However, consider the cost of making these provisions.

The basic source of high cost in this type of substation is the two main breakers and the tie breaker that are used and are not required in two single-ended units. Without these three breakers the double-ended unit substation becomes two single-ended radial units. The main breakers usually are larger than the feeder breakers, not because of in-

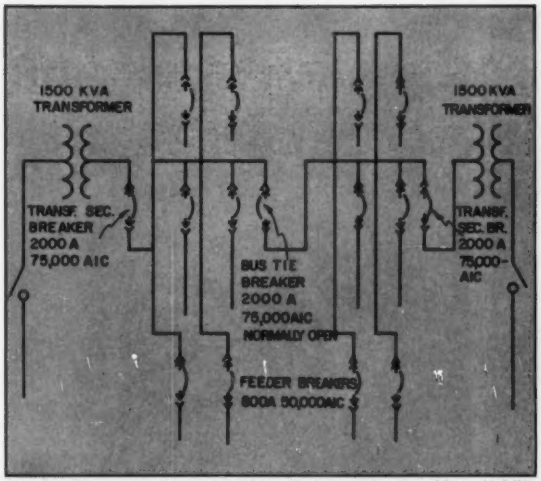

1500 KVA TRANSFORMER
1500 KVA TRANSFORMER
TRANSF. SEC. BREAKER 2000 A 75,000 AIC
BUS TIE BREAKER 2000 A 75,000 AIC NORMALLY OPEN
TRANSF. SEC. BR. 2000 A 75,000 AIC
FEEDER BREAKERS 600A 50,000AIC

Fig. 2. Three breakers, one tie and two main, provide reliability afforded by double-ended units. Load is easily transferred from one transformer to the other in the event one of them is down

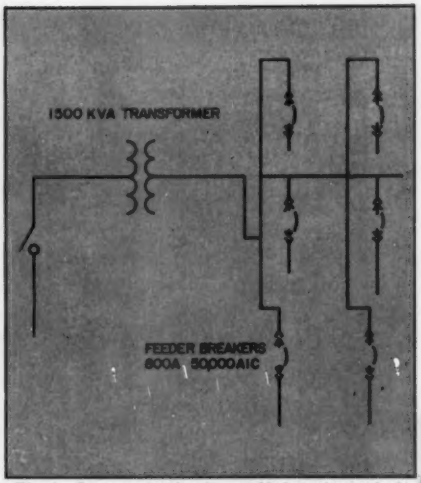


Fig. 3. Same protection is provided to the load circuits under all operating conditions with either one of the double-ended units or two single-ended units

terrupting capacity requirements but because each must carry the full load current of the transformer. This high cost of these breakers can be seen best from a specific example.

Figure 2 is the single line diagram of a 3000-kva double-ended unit substation, a size and arrangement very commonly used in automotive and other large industrial plants. If this substation were built as two single-ended units, the three 75,000-amp interrupting capacity breakers could be eliminated. The single line drawing of this unit is shown in Fig. 3. Figure 5 presents the cost comparison of the double-ended station against two single-ended units.

To show that the 3000-kva unit is not just a fluke, the additional set of bars on Fig. 5 represents a similar comparison between a double-ended 600-kva unit with a secondary of 208Y/120 volts, intended for lighting service, and two 300-kva units. The relative costs in these two examples are typical of those encountered in industrial unit substations. It is apparent that a very large saving usually can be made by substituting two single-ended units for one double-ended unit.

Each of the examples assumes that the feeder breakers will not be cascaded, that each feeder breaker will be capable of interrupting the maximum fault current to which it will be subjected. When the feeder breakers are cascaded the savings shown are not so great. However, the operating disadvantage of cascading often precludes its use.

It is probably evident, at this point, that the substation cost can be reduced appreciably by using two single-ended substations rather than one double-ended unit. It must be equally apparent that this economy was effected at the expense of the reliability that led to the use of double-ended units in the first place. This situation raises the question as to whether or not this reliability can be regained in the single-ended units at a more reasonable cost.

The primary selector switch shown in Fig. 4 is a direct and economical way of providing for primary cable failure. Half of the transformers in an industrial plant use cable A as formal feed and the other half use B. In case of failure of cable A, those on cable A are manually switched to B. Since this is a simpler switching operation than is required on the double-ended unit, it can be accomplished more rapidly in an emergency.

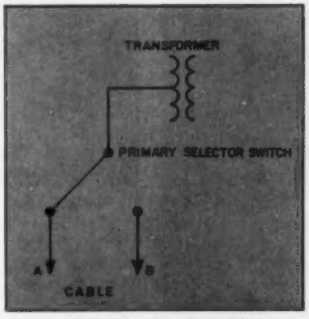


Fig. 4. Primary selector switch can be used to assure continuity of service where cable failure is a possibility

Furthermore, the transformer can still carry full load without being oversize or using fans. This is an extremely important operating advantage of the selector switch arrangement. Primary cable costs are about the same for one double-ended unit or two single-ended units. The selector switch costs more than the simple disconnect but the increase is considerably less than the saving on a low voltage breaker.

The operating record of modern transformers is such that extensive provisions for operating in case of transformer failure are of questionable value. Emergency cables can be used to effect the same operating conditions as a double-ended unit. For example, the joint between the faulted transformer can be disconnected manually without too much difficulty since bare copper bus is used in these units. Tie cables may be run from a spare breaker position or the bus in a nearby unit to the bus of the faulted unit. This can be done at no increase in substation equipment costs.

The operating conditions will be exactly the same as for a double-ended unit under similar conditions. Installing the emergency cable, however, will take longer than manually operating the main and tie breakers of a double-ended unit. This must be weighed against the saving in equipment cost, remembering the good service record of modern transformers.

If transformer failure is still a worry, a small part of the savings realized by using single-ended units

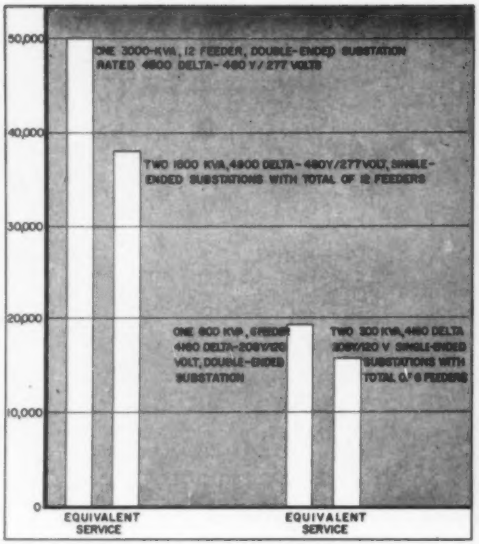

50,000
40,000
30,000
20,000
10,000
0
ONE 3000-KVA, 12 FEEDER, DOUBLE-ENDED SUBSTATION RATED 4800 DELTA- 480 Y / 277 VOLTS
TWO 1600 KVA, 4800 DELTA- 480Y/277 VOLT, SINGLE-ENDED SUBSTATIONS WITH TOTAL OF 12 FEEDERS
ONE 800 KVA, 6 FEEDER 480 DELTA-208Y/120 VOLT, DOUBLE-ENDED SUBSTATION
TWO 300 KVA, 480 DELTA 208Y/120 V SINGLE-ENDED SUBSTATIONS WITH TOTAL OF 6 FEEDERS
EQUIVALENT SERVICE
EQUIVALENT SERVICE

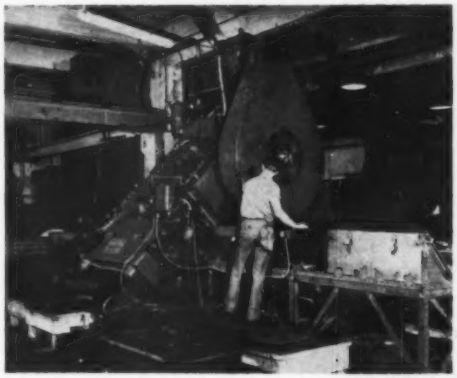
Fig. 5. Major cut is made in substation cost, regardless of size, by using two single-ended units instead of a double. Double-ended reliability may not be warranted

Fig. 6. Two single-ended substations serve where one double-ended unit might have been used. The 500-kva unit (left) and the 1000 kva unit (right) are completely independent

might well be invested in a spare transformer. The spare unit would always be available to provide extra transformer capacity whenever needed. The cost would be only a small part of the savings in a large plant. For example, the 1500-kva transformer of Fig. 2 costs only $10,240.00. The saving realized by going to single-ended construction in just this one station is $11,750.00!

A review of the conditions surrounding the use of double-ended units indicated that they are not always the best nor the most economical way of providing a reasonable degree of reliability in industrial unit substations. In some cases they are the only satisfactory means of meeting certain load conditions. Before a final decision is made in favor of double-ended units, their cost should be compared carefully with that of two single-ended units.

Variable Speed Drive for Presses



ITS OWN BEST example for use of variable speed drives, The Reliance Electric & Engineering Co., Cleveland, O., has installed them for punching of laminations in Minster 45-deg-inclined, adjustable speed presses of 100-ton capacity. As shown in photo at left, with space unavailable at floor level for the drive equipment, it is mounted on girders near the ceiling, left rear. Note also convenient fabrication of storage lockers below the feed bench to right of press, with locks for operators to keep their own tools, etc. Photo at right shows rear of the press, with stacked piles of laminations, which can be produced considerably faster with the special press installations of this type. Silicone strip steel stock is used for stamping of these stator, rotor laminations.

ISOTOPES—Save Hours of Production, Maintenance Time

A new scientific group is applying the products of Canada's Chalk River atomic pile to speed up maintenance and production work in various industries . . . Some of Oak Ridge's isotopes, similarly, are helping industry

ISOTOPES, PARTICULARLY Cobalt 60, produced at Canada's Chalk River Atomic Project and at the United States' Oak Ridge pile, are playing increasingly important parts in industrial maintenance and production, and non-destructive testing procedures.

One leader in application of isotopes to these problems is Isotope Products Limited, a Canadian firm headed by Dr. D. C. Brunton. In 1950 Dr. Brunton, with the blessings of National Research Council, surveyed nearly 70 Canadian industries and discovered considerably wider application for isotopes than had previously been anticipated. In September, 1950, Dr. Brunton and his associates established themselves in a small plant at Oakville, Ontario, and began a developmental program. Thus far five instruments, including the betameter and gammagage, have been developed and produced by this firm for use in testing procedures. In addition, the procedures themselves have been developed and perfected.

For more than 18 months now, isotopes from Chalk River have been used in several Canadian industries for such purposes as radiographing anything from thin aluminum up to 12 in. of steel; tracing pipeline "pigs"; inspecting and controlling paper production; detecting and measuring corrosion. It is the purpose of this article to recount a few actual examples of such usage.

No Long-Lost Production

At Anglo-Canadian Pulp and Paper Mills, Quebec City, three sulphite pulping digesters (welded steel pressure vessels 16 ft diameter; 58 ft high) were out of service because of suspected serious corrosion. These digesters used in cooking wood chips to pulp, have 1¼-in. steel plate with double brick lining 7 in. thick. Cracks in the lining indicated acid might seep through and corrode the steel shell. It was considered impossible to determine how serious this corrosion was without chipping out the 10,000 bricks which constituted the lining. A long period of lost production was indicated.

Through reports and previous contacts the research and engineering groups of Anglo-Canadian were convinced that the newly invented "gammagage" could measure the extent of corrosion in their digesters. Arrangements were made with Isotope Products for a radiographic survey. Soon, a radiographic examination had been completed on the two lined digesters. Readings were made in complete circles every 2 ft down the entire length of both digesters. Points of corrosion were measured in detail and recorded with precision on the instrument chart. The pattern of corrosion was then transferred onto a blueprint of the digester wall.

Bricks were removed from several points in the digester where corrosion was indicated. It was found that the actual corrosion at these points correspond to that indicated by the "gammagage."

It took approximately 40 hr for the gammagage team to completely inspect and profile both digesters. The alternative would have involved pneumatic drilling out of some 20,000 special type bricks, and finally relaying new bricks after examination of the shell.

To Find the Fracture

In another recent case, a new isotope, Sodium 24, worth about $100 and with an effective (or "half-life") of about 15 hr, was used to examine a fracture in a foot-thick steel.

The fracture had occurred in one of the three large

Photo: Isotope Products Ltd.

Tiny capsule containing isotope sodium 24 is guided into extrusion press cylinder which is already wrapped and prepared for welding. Repair work was started as soon as the extent of fracture in press cylinder was determined

Photo: Isotope Products Ltd.

Gammagage in use for measuring wall thickness of tank

extrusion presses at the Kingston plant of the Aluminum Company of Canada, which produce aluminum tubing and shapes for jet aircraft, naval vessels and military equipment. Welding operations were dependent on non-destructive examination and in less than one day the $100 sodium isotope performed this radiography job which it is estimated would otherwise have required a month with $10,000 worth of radium or $3,000 worth of recently discovered isotope cobalt 60.

Isotope sodium 24 for the Kingston project was made from eight grams of sodium fluoride "though ordinary table salt would have produced very much the same result," according to Dr. Brunton. The salt, in a small aluminum container was irradiated in the Chalk River atomic pile. Removed from the pile the radioactive capsule was slipped into a giant lead case (weight about one ton) for shipment by truck from Chalk River to Kingston. Once it left the atomic pile the isotope has a "half life" of about 14 hr and on its arrival it was quickly put in position.

Working at a safe distance of some 50 feet, the experts lowered an electro-magnet by crane to lift the capsule from its great lead container. In less than a minute the small capsule was swung into the upended cylinder of the extrusion press. The cylinder had been wrapped beforehand with X-ray film and the cylinder, itself, formed a shield to keep the gamma rays from shooting off through the plant. A crack in the cylinder had been filled with lead to prevent gamma rays from escaping at this point.

In Paper Production

At Don Valley Paper Mill, Toronto, a betameter is now controlling basis weight—continuously in production—automatically adjusting the machine to maintain pre-set specifications.

Don Valley uses a Fourdrinier machine to produce some 20 t daily of cover, blotting paper, bristol and tag stocks. Like other mills they have, up to now, relied on sampling and manual adjustment to maintain the basic weight. While raw materials and other factors have been brought under a certain degree of control, it has not been previously possible to control, automatically, the basis weight at production stage.

Last fall, at the request of Don Valley Paper Company's president, Isotope Products installed a betameter for trial runs. On the strength of these trials, the betameter recording device was ordered and it was decided Isotope would investigate the feasibility of linking this equipment with remote control mechanism that operates the "gate." The gate regulates the flow of materials onto the paper making machine; to control this valve is to control basis weight.

Dr. Donald Brunton and Geoffrey Leighton of Isotope Products tackled the problem with Bristol Instrument Company and mechanism was devised to link the betameter directly with the gate control.

"This instrument now does for the machine tender what the automatic pilot does for an airplane pilot," George Wilson, the mill manager who has guided the development reports. "The machine operator merely settles the machine for production of a prescribed paper, zeros the control and flicks a switch."

The betameter is located at the "wet" end of the machine. One arm of the instrument emits beta rays which penetrate through the continuous band of wet paper and are recorded by a detection device in the upper arm of the betameter. The relative basis weight of the paper being produced determines the amount of beta rays absorbed. This is electronically calculated and compared with pre-set standards. Any deviation activates controls which change the gate setting to maintain standards.

Isotopes on Tank Farms

Tanks, new or old, full or empty, are tested, inspected and measured with isotopes. With the development of welding techniques to replace riveting of large tanks, isotopes are playing an important role in checking the quality of welds in oil tank construction. Canada now has oil tanks up to 160 ft in diameter with plates more

than 1 in. thick at the base and with an entire tank weighing 500 t or more. This weight, plus the pressure of 200,000 barrels of oil, puts new emphasis on the quality of welds.

Iridium 192 is being used and thus far some dozen of the largest tanks on two Canadian tank farms have been examined and repaired. The seams were individually radiographed with a continuous row of films. The film was supported by specially designed magnetic holders clamped against the exterior of each weld. By this method all vital welding on a tank has been inspected—with a record permanently recorded on film. Equipment used is so light it can be carried by hand to the top levels of the tank.

When tanks are full, another isotope is used. Caesium 134 is employed in measuring equipment and a special model of this equipment has been developed for oil tanks. Water in oil tanks provides a problem on tank farms. Floats and similar measurement methods only determine the oil level and frequently gum up badly in heavy crude. Isotope caesium 134, incorporated into equipment with electronic level detection devices, runs in a tube inside the oil tank. The isotope never contacts the oil or water but its rays record the respective levels of each. A similar system installed in U.S. refineries uses radium and tells of the level of catalyst beds in catalytic cracking units.

Old oil tanks can be inspected with the gammagage which employs iridium 192 and cobalt 60. The gammagage has been used to inspect similar tanks in the pulp and paper industry. Weak spots and cracks are instantly recorded and corrosion can be measured and continuously profiled with exactitude.

Isotopes in Pipe Lines

Recently Isotope Products developed a new head for the gammagage which adapts this instrument particularly to pipe inspection. Corrosion and erosion in oil pipe line elbows is often severe. Weak spots and blockages can be readily located with this isotope technique.

Isotopes have been used for some time in the inspection of pipe line welds. Radium was used more than 10 years ago to inspect the Arabian desert pipe lines. Five years ago cobalt 60 was being used to inspect pipe lines in southwestern United States. This year, iridium 192 an isotope which gives much better contrast and definition—has been used in Canada on the Sarnia-Toronto pipe line under construction.

On the Sarnia-Toronto project, the isotope is contained in a 30-pound lead trolley wheeled along the top of the pipe. It is clamped over each weld as welding is completed. The isotope exposure is controlled by a remote cable which moves the source into position against the pipe—exposures are about one minute; films are quickly developed in a mobile laboratory which follows the pipe line construction. With the isotope directly in contact with the pipe, approximately 220 deg of the weld can be radiographed with each exposure; a complete weld (and some overlap) pictured with two shots. More than 5000 pictures have been taken this summer on the Canadian line.

Another isotope application to pipe lines is being made in the United States where a small amount of isotope antimony 124 is squirted into a products pipe line to mark the boundary between one product and another. When the last of one product reaches the pipe line terminal, isotope radiation activates an alarm to warn the operator. Further development of this technique activities valve controls; a radioactivity detector triggers the valve control to automatically direct each product to its proper route.

Another isotope project associated with pipe lines is "pig-chasing"—a technique of no agricultural significance. A "pig" ("go-devil" is another name for it) is a rubber buffer; it may carry wire brushes. This pig is pushed through the pipe line by oil or water pressure to clean the line before and during operation.

Radium was first used on pipe line pigs in the Middle East to determine their progress. There the pipes are generally above ground. In Canada weather conditions necessitate burying of pipes and the radioactive isotope must emit rays which can penetrate four to five feet of soil for surface detection.

Photo: Schutte & Koerting Co.

Lead box and concrete vault for housing capsule of isotope cobalt 60. Capsule is suspended by wire at left side

On the 1200 mile Interprovincial line from Edmonton to the head of the Great Lakes, Isotope Product engineers followed a radium tracer attached to a pig. More recently on the Sarnia Products pipe line cobalt 60 was used. Geiger counters at fixed stations and very sensitive detection instruments accurately timed the pigs progress—and quickly located the pig when it became stuck. In two cases pigs became stuck in valves and were readily traced.

For Castings Inspection

Another example of inspection through the application of radioactive materials recently was put into operation at the Bucks County plant of Schutte & Koerting Co. The equipment used, besides a 250,000 v X-ray machine is a capsule of Cobalt 60 produced at the Oak Ridge atomic pile.

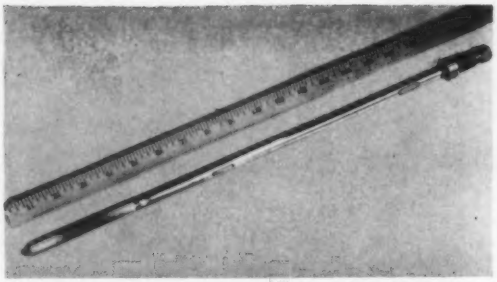
The Cobalt 60 inspection is accomplished by placing a small cartridge of the radioactive element on the end of a long rod, holding it close to the surface of the casting, and using the rays produced to photograph through the casting.

These activities take place in a specially constructed three-room laboratory, which is divided into an exposure room, an operator's control room, and a dark room for developing films. The three rooms are separated by walls of 12-in. thick concrete. A lead sheet, ⅛ in. thick, is imbedded in the wall separating the exposure area from the other rooms. A series of interlocking devices between entrances to the exposure room and the X-ray machine assure automatic turning off of the machine should anyone attempt to enter the room while the machine is in operation.

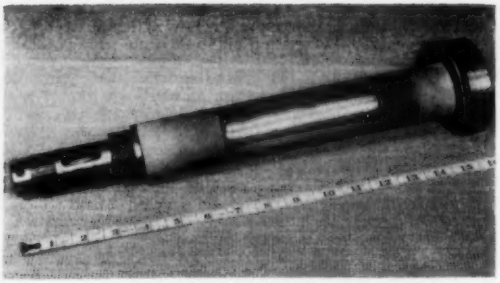
Since radiographic inspection involves use of radioactive materials, Schutte and Koerting takes special precautions to protect personnel working in the laboratory against the effects of radioactive rays.

The Cobalt 60 capsule is kept in a solid 3-4 in. wall lead box in the center of a concrete vault. Handling procedures guarantee complete personnel protection.

Each person working in the laboratory carries a special radiation measuring device which registers accumulated exposure. These devices are checked at the end of each working day to determine whether individual exposure to radiation is remaining well within predetermined safety limits. As a final precaution, all operating personnel are given periodic examinations.



Core rods must resist severe abrasion, loading and deformation. Tungsten carbide over strong steel provides good properties



Both bearing surfaces of this machine spindle have been plated. They are shown as-coated; they will be ground

FLAME PLATING

A new method of applying powdered metals—like tungsten carbide—to metal parts to increase abrasion and frictional resistance, and increase resistance to impact and thermal shock

ONE OF THE BIGGEST advantages of this new process, developed by Linde Air Products Co., is that the temperature of the base metal does not exceed 400 F during the plating operation—even when tungsten carbide is being deposited. The low-temperature deposition practically eliminates any possibility of a change in the properties of the metal being plated, and reduces to a minimum the chance that the part might warp.

The process is adaptable. Flat areas, cylinders, holes, and parts having various shapes and contours can be coated. Surfaces up to 6 in. wide and 40 in. long can be handled with present facilities. The plated part can be used as-coated or ground to a mirror finish.

In the majority of applications listed to date, parts Flame-Plated with tungsten carbide have shown wear resistance equal—or superior—to the sintered tungsten carbides—and vastly superior to cast alloys, hard chrome-plating, and tool steels. Parts Flame-Plated with tungsten carbide have all of the desirable properties of sintered tungsten carbide—such as resistance to abrasion and frictional wear, and in addition, have a lower modulus of elasticity, and greater resistance to impact and thermal shock. Metals other than tungsten carbide have been deposited by this new method.

There is a large field of application for this process. It can be used wherever an undiluted coating of tungsten carbide is required to protect metal parts from severe abrasion and frictional wear. Cotton picking spindles, dies, seaming rolls, and burnishing tools are good examples of parts exposed to this type of wear. Up until now, the tungsten carbide applied to these parts was diluted either by the base metal or the steel welding rod used as a binder.

It can be used for protecting precision parts—where the wearing away of a few thousandths of an inch of metal would make the part useless. Up until now, many of these parts were made of sintered tugnsten carbide. When the surface wore away, the entire part had to be scrapped. Flame-Plating a steel part will prove to be an economical solution to this problem. Some of the parts that fall into this category are plug and thread gages and arbors.

Up until now tungsten carbide couldn't be deposited on many metal parts because the heat required for the facing operation would distort the part or change its metallurgical properties. This new process eliminates this problem. Now saw teeth and paper slitter knives can be protected by a hard coating.

Flame-Plating will fit into the picture where some degree of toughness is required in a wearing part. Core rods used in powder metallurgy, for example, are excellent applications.

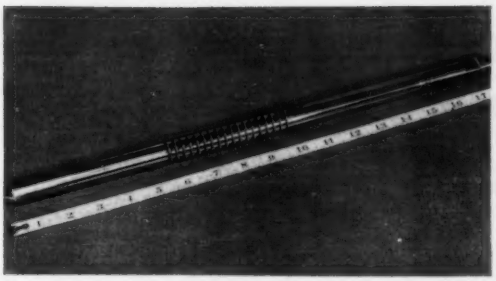
The decision as to when to use this new process will have to be based on a number of factors. The cost of Flame-Plating a part, in actual dollars and cents, will fall somewhere between the cost of a hard-faced part and a sintered tungsten carbide. A plug gage processed by this method, for example, will cost more than a gage made of a cast alloy, but less than one made of sintered tungsten carbide. Of course, the outlay of dollars must be balanced against the service life. Very often the

Places and Prices

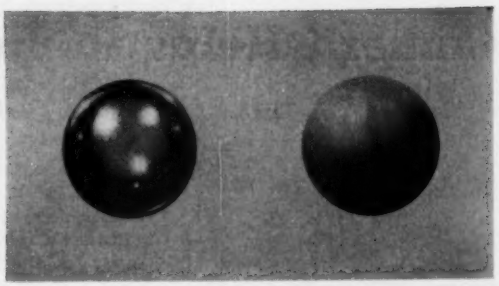
Commercial Flame Plating is performed at a central location in the Mid-West. Articles are prepared for processing by the customer, sent in for coating and are returned to the customer. Finish grinding may be done by the customer or may be contracted according to Linde.

There is a wide variation in present charges for Flame Plating. Costs are influenced by a variety of factors such as shape and size of part, thickness of plated deposit, and number of articles in run. In general, small articles carry the highest charges per unit area of tungsten carbide plating and, naturally, the charges increase as the thickness of plated deposit increases.

Prices range from 70 cents per square inch for 0.001 in. thick tungsten carbide plating on cylindrical articles over 1½ in. in dia, to $10.00 per square inch for 0.010 in. thick deposit on cylindrical articles ½ in. in diameter. The charges for plane areas fall within these limits.



Flame Plating is well suited to burnishers. Cutting areas are coated so they will long maintain close tolerances



Spheres, such as these balls used in check valves, are Flame Plated. The ⅞ in. dia steel ball on the right is shown as-coated

time and money a long-wearing part saves by reducing down-time for maintenance and repair more than offsets its initial cost.

Through the use of the process, tungsten carbide can be deposited on almost any base metal. Steels of all types, cast iron, aluminum, copper, brass, bronze, titanium and magnesium have all been coated sucessfully by this new method.

The size of the parts that can be Flame-Plated are limited by the handling equipment available at the present time. These limitations will be relaxed as the equipment is improved. The areas that can be coated vary with the shape of the part. Here is a quick summary of what can be done now:

Flat surfaces 6 in. wide and up to 40 in. long can be processed in thicknesses up to 0.020 in., provided the part is to be used in the as-coated condition. If the part is to be finish-ground, the width limitation is ¾ in.

Cylindrical objects from ⅛ in. to 6 in. in diameter can be handled with the present equipment. Smaller or larger diameters may be plated but these would require special handling. The limitation on the length is 40 in.

Holes or internal areas of cylinders can be plated to a depth equal to the diameter. A one inch hole can be plated to a depth of one inch.

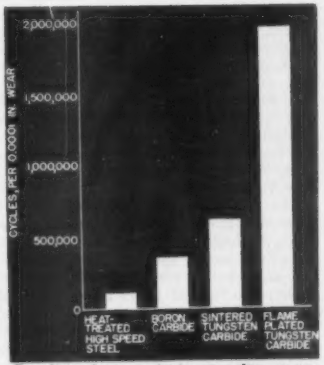
Irregular-shaped objects can also be handled. The width and length limitations are the same as for cylindrical and flat areas. The rule on irregular-shaped objects is that any area that can be covered directly from the horizontal plane to an angle no greater than 45 deg from the horizontal can be successfully Flame-Plated.

The parts to be processed should be undercut just deep enough to allow for the desired thickness of the coating. It is advisable to leave a small protective lip at any edge where the part may be subjected to abuse or where two Flame-Plated surfaces are at right angles to each other. This is especially important on plug gages, shafts, spindles, and core rods.

Although the maximum thickness obtainable is 0.020 in., few applications would require a thickness of over 0.005 in. A coating thickness of a few thousandths of an inch will resist mechanical and thermal shock to a much greater degree than will a thickness of 0.010 in. or 0.020 in. A coating thickness of 0.001 in. over the allowable wear tolerance is sufficient in most instances.

If the part is to be finish-ground an excess coating of 0.004 in. is deposited. However, it may be desirable to use the as-coated surface. This surface is 125 microinches rms, as measured by a Brush Analyzer. The processed surface can be ground to a finish of approximately 2 microinches rms.

Resinoid bonded diamond wheels are the only grinding wheels suitable for finishing a Flame-Plated surface. A 100-mesh wheel should be used for rough-grinding and a 400-mesh wheel for finish grinding when no more than 0.0005 in. is to be removed. Before grinding, the flow of coolant should be adjusted so that the part is flooded. Fifty per cent water and fifty per cent soluble oil, or fifty per cent kerosene and fifty per cent spindle oil are good coolants.



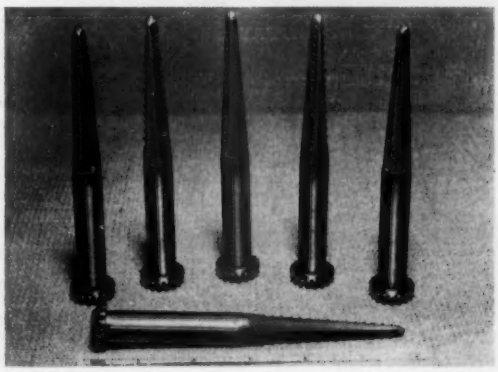
Results of wear tests on plug gages using medium of cylinder block cast iron

For Additional Information

Readers who want additional information may obtain it by writing The Editor, Plant Engineering, 110 South Dearborn St., Chicago 3, Ill. Or use the postage-paid card elsewhere in this issue.

One good example of the Flame Plating of irregularly-shaped objects is supplied by illustrated thread gages

Barbs on these cotton picker spindles are worn down by sand in cotton boll; the coating protects them from fast wear



Camera Helps Reduce Accidents At Crucible Steel Co.

With the aid of a camera, the safety department can show the men what caused the accident and how it can be prevented in the future . . . Through the use of a camera and other safety devices in the plant, the company has greatly reduced its frequency and severity accident rates

"SHOOTING" YOUR WAY to lower accident frequency and severity figures is possible—with a camera.* Just ask Warren E. Hall, Supervisor of Safety at the Midland, Pa., works of the Crucible Steel Co. of America, who has done just this.

Their use of the camera is based on the premise that you can talk to men about what caused an accident, you can tell them of the need for good housekeeping, you can describe the dangers of misplaced tools and equipment and if you are lucky you will get maybe 50 per cent of what you are saying across, but if you can show them pictures of these things you will show them how to halt them.

The value of graphic illustrations in explaining accident causes and safety hazards is shown in the constantly declining frequency and severity rates of the company during the last 5 years. The 1951 figures show the plant below the over-all industrial average, as well as the average for steel companies. Midland has a frequency of 2.12, and a severity rate of 0.74. And so far in 1952, the accident picture promises to be still better.

A staff member of the safety department travels throughout the steel works taking pictures in all departments. Unsafe conditions and practices are recorded on the spot; extremely dangerous misdemeanors are remedied immediately, of course. The safety staff, on 24-hour call for all accidents, takes pictures of every accident to show exactly how it happened. Then the pictures are put to work.

*Readers may be interested in reading the articles "Camera at Work." Part I appears in the March, 1952 issue, page 69; Part II appears in the April, 1952 issue, page 90.

Camera is used by the safety department to photograph accidents as well as hazardous conditions throughout the plant

Each Accident Is Photographed

Each lost-time accident at all plants of the company must be reported, in detail, to management in Pittsburgh. Accident reports include a photograph of the accident in addition to a complete written description. If the accident's cause or causes can be traced to insufficient safety precautions—a fault which often can be remedied by the installation of safety equipment—management takes immediate steps to secure the needed protection. More often, however, accidents are caused by "human failure." The pictures help to reduce these human failures.

Safety meetings are held on a regular schedule, and the accident pictures are the features of every meeting. Meetings are held on three levels: the general superintendent meets with department superintendents; department superintendents meet with the foremen in their departments; and foremen meet with the men under their direct supervision. The safety department takes an active part in all meetings held.

Each meeting begins with a report of progress made toward eliminating safety hazards discussed at previous meetings. Reports of careless and unsafe practices are made and suggestions are offered to combat them. At this point in every meeting the pictures are introduced. Since the safety department is constantly at work with the camera, few hazards escape detection and consequent discussion at one or all of these meetings.

New Employees Wear White Arm Band

Realizing the extra hazards confronting new employes, the safety department takes extra precautions in their case. Each new employe must wear a white arm band for a period of 30 days. This arm band identifies him immediately, to all personnel, as a new employe, one who might overlook hazards well-known to old hands and who, therefore, needs help. This regulation applies to all new employes, regardless of their steel mill experience. The safety department feels that although a man may have worked for years on an open hearth furnace, unless he has worked on the Midland open hearths, he is a brand-new man and needs the protection the white arm band affords.

The white arm bands grew, quite naturally, from the number of accidents involving new workers. The entire safety program has been shaped in this way. Complete records, by department and by job, are kept of all accidents. From these records, which show the cause of the accidents, safety measures are initiated.

First, a daily record of all accidents in each department is made. Every day each department head receives the record of accidents in his department during the preceding day. Then, a monthly compilation is made which shows accidents by causes and the departments in which the accidents occurred. Another form lists num-

ber of employes in each department, number of disabling and lost time accidents, and frequency and severity rates for the current month, the year to date, and the average for the past five years, all by departments. The latter is sent to department heads and to the home office in Pittsburgh.

These records help the safety department and department supervisors maintain control over the common causes of accidents at the plant. It was largely through such records that the safety equipment now used was first installed.

Safety Equipment Used at Crucible

For example, a dust respirator is widely used in the plant. It offers protection for workers who are tearing down furnaces, repairing or replacing flues, blowing out motors and unloading lime and silicons. It is also used in many other cleaning jobs in the plant where workers are exposed to nuisance, fibrosis-producing or toxic dusts.

The safety department makes the rounds of the plant to find out the extent of these dust hazards. With the use of equipment to determine the dust concentration, the safety department samples air at the rate of 1/10th of a cubic foot per minute.

Personal protective clothing and equipment form only a part of the precautions taken to keep accidents from happening. A constant check for carbon monoxide is made in the blast furnace area. One workman, especially chosen for the job, is equipped with a carbon monoxide indicator. He takes air samplings with the portable indicator, and sounds a warning bell to clear the area if he finds a dangerous concentration of CO. Although ventilation in the area is at most times adequate, the safety department has found that the wind can change so suddenly that lives may be jeopardized.

The indicator used is hand-operated and can be employed safely even where flammable gases may be present. It shows the presence of carbon monoxide in any atmosphere, indicating the percentage on a direct-reading calibrated meter which has a scale range from 0 to 0.15 per cent CO.

There is also a need for certain protective devices in the coke plant. The nature of operations here demands that adequate protection against explosions be afforded. This problem has been solved with the use of flammable gas indicators for making periodic tests of gas or vapor in air mixtures. Combining the use of the portable indicator with an alarm and a gas-purging system, Midland has greatly reduced the possibility of explosions at the coking plant.

Periodic cleaning of coking plant tanks is done by workers equipped with fresh air hose masks. Every workman who must enter the tanks wears a gas-tight mask assembly fitted with a hose which runs from the mask to a pump. Fresh, clean air is sent back through the hose to the mask. With this form of respiratory protection, a man can work for extended periods in confined areas where high concentrations of gas exist.

Wherever a job must be done in an area which has been checked and found lacking in oxygen, workers are equipped with an oxygen breathing apparatus. This apparatus generates its own supply of oxygen for the wearer, providing complete respiratory protection for a minimum of 45 min in highly toxic gaseous areas or in any area where oxygen deficiences exist.

Although all precautions are taken to protect workers against carbon monoxide and other toxic gases incident to steel plant operation, the company believes in having immediately available equipment embodying the latest advances in automatic artificial respiration technique. Such equipment is on hand at each blast furnace, so that rapid treatment is possible. A unit is also kept at the coke plant; still another will soon be installed at the plant hospital, and a unit for the plant ambulance is also planned.

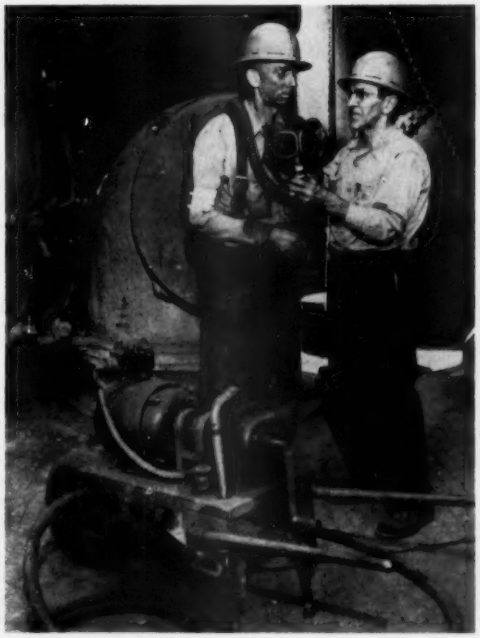
The automatic respiratory equipment administers artificial respiration by intermittent positive pressure, without negative pressure during exhalation, which might be harmful to lung tissue, especially where irritant gases have been inhaled. Oxygen is administered automatically in precisely the right amount, to victims whose breathing has ceased; and the instrument automatically switches over to an inhalator phase, feeding oxygen on demand, when the patient's breathing is restored.

A constant check of areas where explosions might occur are made with this portable instrument which measures the amount of explosive gases or vapors which are in the air

Because the first few minutes after breathing ceases are the most important ones, manual artificial respiration should be administered immediately while the automatic equipment is being hurried to the scene. To this end, the employes are trained in the latest methods of manual artificial respiration.

Most of the safety equipment used by this company was developed by the Mine Safety Appliances Co.

Each worker is equipped with a mask when working in confined areas. Fresh, pure air is pumped to the mask by the motor-driven blower which is shown in the foreground



MAINTENANCE COATINGS—

Liquid Neoprene One of the Newer

By R. C. GEROW, Gates Engineering Co.

PROTECTING THE EXTERIOR of tanks, process equipment, structural steel, pipelines and machinery has long been a bugaboo for the plant engineer. Neoprene in liquid form is a recent addition to his protective coating aids; it can easily be brushed or sprayed. No elaborate surface preparation is required for application of liquid Neoprene and the material cures at room temperature without being accelerated. This liquid furnishes a one part system that protects metals, wood and concrete against corrosion and weathering. The cost per gallon of material is comparable to that of the better paints and application costs are low because fewer coats are needed. Over-all maintenance costs have been, in many cases, reduced.

Minimum unit coat thicknesses of 3 mils are obtained per application. Thus, meeting the minimum protection of 5 mils universally specified by corrosion experts is easily accomplished with liquid Neoprene in two coats. This obviously holds to a minimum the labor required in applying multiple coat systems.

A study made in the chemical industry revealed that there is no point in exceeding three coats (including one coat of primer). One reason: each additional coat over three will increase maintenance costs an average of 17 per cent. Another reason for not exceeding three coats: for general maintenance painting as a practical matter it is difficult enough to get three coats applied properly without insisting on any additional ones.

Liquid Neoprene is supplied in cans ready to be applied. There is no special technique required in brushing or spraying. The manufacturers recommend that it be applied with a full brush with just a following light stroke or two used to smooth the material. Liquid Neoprene is sprayed with standard spraying equipment. Standard colors: black, dark grey, light grey and red are stocked ready for immediate shipment.

A manufacturer of floor coverings coated the outside of a mixer to protect it against corrosive vapors. Two coats of Neoprene were brushed over rusty steel. The coating was subjected to temperatures of 210 F and after a year's operation the protection has been excellent. This brings us again to the point that surface preparation is not critical. It is recommended that for the ultimate in adhesion a primer be used after removing any loose rust or grease that might be present on the surface of the equipment to be protected. A satisfactory bond is obtained over rusty steel without surface preparation, however, as shown by this experience.

Neoprene films do not become brittle or crack in ordinary service and good adhesion is obtained to practically every surface, including cured rubber or Neoprene. This means that if a recoating job is ever necessary, retouching may be done without having to remove the old coating. This affinity of Neoprene to rubber and rubber-like products has also made liquid Neoprene a valuable material in the repair of rubber belts which have become badly worn and torn.

A mid-western chemical manufacturer had been using a sheet lining material costing several hundred dollars applied on a large outdoor storage tank and the inside face of its steel cover. After three months, the sheet fell off. Two coats of liquid Neoprene maintenance coating were applied over a primer. After nine months, the lining is in perfect condition and giving excellent service against hydrochloric acid fumes and splashes.

Control System Prevents Conveyor Jams at Birds Eye

Previously, because of independent controls, the flow of beans would jam up on the conveyors, causing them to pile up and spill onto the floor . . . With present control hook-up, operator has complete control over the flow of raw materials and is warned of impending jams

By **HOWARD E. KIO, Supervisor of Mechanical and Electrical Maintenance, Birds Eye Div., General Foods Corp., Fulton, N. Y.**

IN OUR BEAN processing building, there are 76 motors, with manual start and stop starters and overload protection on each motor. In addition to these manual controls, there are 18 magnetic starters controlling all the motors, grouped together on one board.

With this arrangement the operator can start up or shut down all the machines in the entire room within 5 seconds. (The blanchers are the one exception to this, as the material in them must continue to come out, or else it will be overcooked.) In case of a break-down or jam any place, this immediate stop in production saves the expensive raw material from piling up, dumping on the floor, and being wasted.

At present, additional controls are being installed, as explained in the wiring diagram and in the following paragraphs. These will give the operator complete control over the flow of raw materials, all the way to the packaging room, 300 ft away.

Flow of Materials

After the beans have been processed by the machinery in the processing room, they dump into an elevation conveyor that carries them up into an overhead conveyor. This overhead conveyor carries the beans halfway to the packaging room, where it dumps into another overhead conveyor which carries the beans the remainder of the distance to the packaging room.

Trouble in the past was experienced when starting up the processing room machinery and the elevation conveyor, without starting up the two overhead conveyors. Or trouble might develop, which would stall one or both of these overhead conveyors without the knowledge of the processing room operator.

In either case, when the flow of beans from the elevator conveyor hits a stalled overhead conveyor, the natural result was that the beans would spill over to the floor. This waste of expensive processed material would continue until the operator noticed it and shut down the elevation conveyor and the processing room.

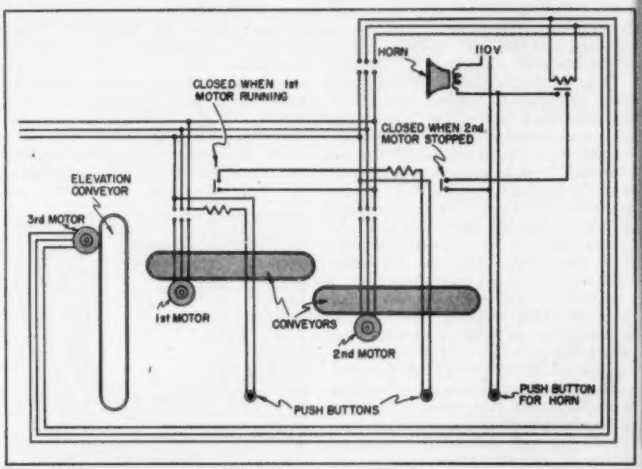
To solve this problem, a horn has been hooked up to the controls to notify the processing room operator of any trouble. If he should start up the elevation conveyor without starting the overhead conveyors, the horn will blow until he rectifies that mistake. If trouble of any sort should stall the overhead conveyors, the horn will blow, notifying him to shut down the elevation conveyor, and the processing equipment, to prevent a pile-up of beans.

Conveyor Hook-up

Trouble in the past was also experienced when, for any reason, the second overhead conveyor might be stalled. In such a case, the beans flowing into it from the first conveyor would pile up and be lost. The controls of the two conveyors are now hooked together, so that the first conveyor cannot be started unless the second conveyor is already running. Also, if either conveyor should break down or stall, both conveyors will stop and the operator will be notified by the sound of the horn, as explained above.

This same horn can be operated by push button by the operator in the packaging room to notify the processing room operator of the needs of the packaging room. A code system of horn toots tells the processing room operator to speed up, slow down, or stop entirely the flow of materials, or notifies him to answer his telephone for further instructions.

Thus, through the installation of adequate electrical controls, one operator is given knowledge of the needs of the entire plant, and the ability to control the flow of materials accordingly.



Wiring diagram of signal system which gives operator complete control over material flow. (Alterations of author's sketch were made for purposes of clarity)

BALL BEARINGS—

Their Lubrication, Care and Replacement

MUCH OF TODAY'S industrial machinery operates on ball bearings. For this reason, it is important that everyone concerned with the operation and maintenance of this machinery be adequately informed about the lubrication and care such bearings require. This is necessary, since ball bearings are constructed with great precision and do not have the comparatively large clearances of plain or sleeve bearings. The operating life of a ball bearing is therefore directly dependent on the care with which it is maintained.

It is of primary importance that only intelligent, trained personnel be entrusted with the lubrication and maintenance of ball bearings. Explanatory literature, which can be obtained from bearing and lubricant manufacturers, should be made available to them. Where special problems are encountered, the advisory services of trained lubrication specialists may be obtained from the lubricant manufacturers.

Another important requirement of adequate ball bearing maintenance is a definite, faithfully followed plan of regular periodic care. Such a plan should be based on the recommendations of the machinery or bearing manufacturers. But, because of variations in operating conditions in different plants, the actual requirements of individual bearings should be taken into consideration. These can best be determined by noting the condition of each bearing every time it is opened for inspection or servicing. After a time, it will thus be possible to set maintenance periods accurately. This will insure maximum bearing life and minimum lubrication and maintenance cost, because it should be remembered that a ball bearing operates best on a minimum quantity of lubricant, and it has been claimed that 75 per cent of bearing failures are due to over-lubrication.

Some form of record system should be established to handle all machinery lubrication and bearing maintenance and a section should be devoted to ball bearings. A card file is one of the simplest and most practical forms of lubrication records. Only where records are carefully kept can assurance be had that no bearings are overlooked. It should be borne in mind that the failure of even an insignificant bearing can shut down an entire machine or process.

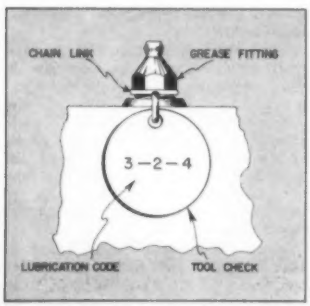


Fig. 1. Identification makes it safe for the bearing, easier for the lubricator

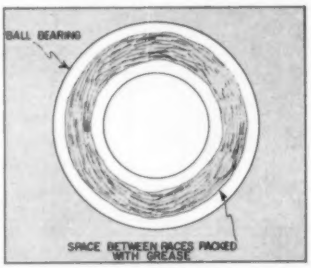


Fig. 2. Proper packing between races is important for long bearing life

To insure that only the proper quantity of the proper lubricant be applied at the proper intervals to each bearing, it is advisable to adopt some form of identification system. One method consists in attaching a metal tool check to each lubricant fitting, as shown in Fig. 1, bearing a code of numerals. The first numeral indicates the number of strokes of the grease gun required to supply the correct quantity of lubricant. The second numeral signifies the identification number of the lubricant to be employed. And the third numeral shows the frequency of lubrication: 1, indicating yearly; 2. semi-annually; 4, quarterly; 12, monthly, etc.

The lubrication man is thus informed at a glance which bearings require lubrication, and how much of what lubricant is to be applied. This eliminates the necessity of consulting records for each machine. Of course, this procedure applies only to bearrings lubricated with grease. Oil lubricated bearings will be discussed later.

In addition to determining the quantity of lubricant remaining in the bearing housing at each inspection, it is also important to note the condition of the lubricant. If the enclosure has not been overfilled (is not more than half-full), yet the grease shows excessive deterioration, it is likely that it is not a suitable type for the particular application. Grease that has left deposits of hard soap, or has become emulsified by mixing with moisture, also comes within this category.

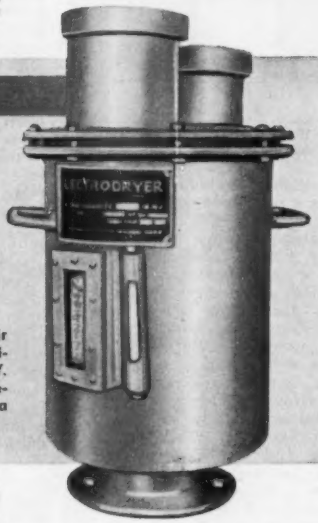
Generally, a grease having calcium or lime soap base is suitable for ball bearing lubrication, under conditions where the bearing temperature does not exceed 150 F.

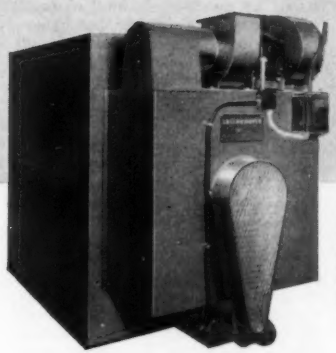
Photo: Marlin-Rockwell Corp.

Don't do this. Use of a cold chisel and hammer is almost certain to damage bearing when removing it from shaft

Put your storage tanks on a DRY air diet with Lectrobreathers*

The moist air they're inhaling wastes money and destroys quality





A tank breathes freely, as air passes through the charge of Activated Alumina and is dried DRY. When a Lectrobreather needs reactivation, it is lifted off and a spare takes its place.

Where volumes of air passing in and out of a storage tank are sufficient, a Lectrodryer* is used. Since its DRYing-reactivating cycle can be reversed as required, it stays right on the job.

A processor was buying certain liquids in drums, *at premium prices*, because the moisture in the air the storage tanks inhaled injured their quality. Then he discovered Lectrobreathers, which feed only DRY air to the tanks. Now he buys in tank-car lots, saving on raw materials, saving on handling and holding quality constant.

An oil company safeguards its fine lubricating oils against contamination by water from the time it is refined until it is safely packaged. They hold a blanket of DRY air over the oil by forcing the tanks to breathe through Lectrodryers that remove every trace of moisture from the air.

Lectrobreathers and Lectrodryers will make certain that any tank, little or big, breathes only DRY air. Which to use is determined by the size of the DRYing task: A Lectrobreather has a color indicator which tells when it should be reactivated. Operation of a Lectrodryer can be made fully automatic.

For help in selecting and applying the DRYing equipment you need, tell your problem to Pittsburgh Lectrodryer Corporation, 333 32nd Street, Pittsburgh 30, Pennsylvania.

In England: Birlec, Limited, Tyburn Road, Erdington, Birmingham.
In Australia: Birlec, Limited, 51 Parramatta Road, Glebe, Sydney.
In France: Stein et Roubaix, 24 Rue Erlanger, Paris XVI.
In Belgium: S. A. Belge Stein et Roubaix, 320 Rue du Moulin, Brasseur-Liege.

LECTRODRYERS DRY WITH ACTIVATED ALUMINAS

LECTRODRYER

*REGISTERED TRADEMARK U.S. PAT. OFF.

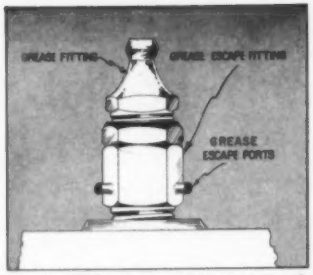


Fig. 3. When escape ports are present, grease should be added until it shows

Where higher temperatures prevail a sodium soap base grease usually should be used, provided the high starting and running torque caused by the fibrous character of the grease is not objectionable.

Greases combining calcium and sodium soap base types usually possess features of both types, are of buttery texture, hence have very low torque, and can be used where bearing temperatures reach 200 to 250 F. However, when a grease is subjected continually to temperatures in excess of 200 F, frequent cleaning and relubrication of the bearings are required.

Where a grease must be used in the presence of water, its composition must be such that it will not emulsify or wash away.

Greases suitable for ball bearing lubrication should generally be of a consistency a little stiffer than vaseline, about like No. 2 or 3 automobile grease. This is soft enough not to dry, yet stiff enough not to churn at high speeds. It should have a mineral base, not vegetable or animal, as these are likely to gum, and become rancid and develop acid. The grease must also contain no solid matter. Other characteristics required are unvarying consistency, resistance to oxidation and rust, and low internal friction.

Where unusually severe operating conditions justify the additional cost, silicone greases possess certain advantages over petroleum greases. For example, one type has proven satisfactory for use in ball bearings operating at speeds as high as 70,000 rpm, and where temperatures range between minus 100 F and plus 300 F. At the 300 F temperature, this grease outlasts high temperature petroleum grease 3 to 1.

The principal functions of grease in a ball bearing are to furnish a lubricating film between the balls and their separators, to protect the highly polished surfaces from rust and corrosion, to dissipate the heat produced by the deformation of the rotating parts under load, and to help prevent the entrance of abrasive dust, acid fumes and other damaging materials into the bearing.

It is very important that ball bearing grease be handled and applied to the bearing with extreme care to insure cleanliness. Since ball bearing parts operate under great pressure, in metal-to-metal contact, and the clearances are small, the entry of even a small quantity of diamond-hard dirt particles will produce, in combination with the grease, an effective grinding compound, that will quickly destroy the original close fit of the bearing and impair its operation.

Grease containers should be kept tightly covered in a dust-free atmosphere. Before transferring grease from containers to grease guns, and to bearing lubricating fittings, carefully wipe all dust from the surfaces. Never use wood paddles to handle grease. A metal paddle or clean putty knife is ideal since it is splinter-free. Always use older grease first.

Ball bearing enclosures should never be filled more than half-full (preferably one-third full) with grease. It is important that this precaution be followed otherwise bearing damage may occur. Overloading causes grease churning and resultant overheating; excessive pressure is built up which may damage the shaft seals; and the resistance offered the rotation of the bearing parts may cause the formation of flat spots and roughness, which will become progressive and require replacement of the bearing.

Some ball bearings will operate for periods of several years before requiring attention. These are prelubricated at the factory and are provided with seals to retain the grease. The manufacturer's instructions should be followed as to periodic disassembling, cleaning and relubrication.

Other ball bearings are pre-lubricated, provided with effective seals and require no further lubrication or attention throughout their operating life. However, some sealed bearings are provided with openings through which a special needle is inserted through the seal to introduce a fresh supply of oil or grease lubricant, usually once a year under average operating conditions.

Ball bearings that require periodic attention should be inspected at established regular intervals, depending upon individual requirements or the recommendations of the machinery manufacturers. At these inspections the housing should be carefully cleaned of all accumulated dust, opened, the condition of the bearing and grease noted and, if satisfactory, additional grease added if required, as already explained. Should grease deterioration be discovered in a bearing, either the grease is not suitable or the bearing requires more frequent attention.

Bearings should always be cleaned of all old grease before lubricant deterioration occurs. The schedule for this periodic cleaning should be based on conditions found at periodic bearing inspections, but generally no more than two years should elapse between cleanings.

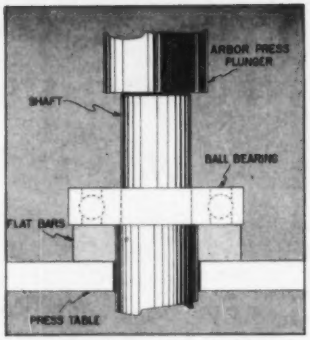


Fig. 4. Flat bars, of exactly the same height, should be used to apply even pressure to the bearing inner race only

The old grease should be removed with a scraper or brush, the housing flushed out with hot light oil (the bearing being slowly rotated at the time), then drained. Thorough cleaning is necessary in order to remove all grit from the bearing. If the bearing can be removed from the housing cleaning can be more readily performed.

To remove badly oxidized grease, an emulsifying solution of cutting compound and hot water can be run through the housing. After thorough draining, the bearing and housing should be flushed thoroughly with

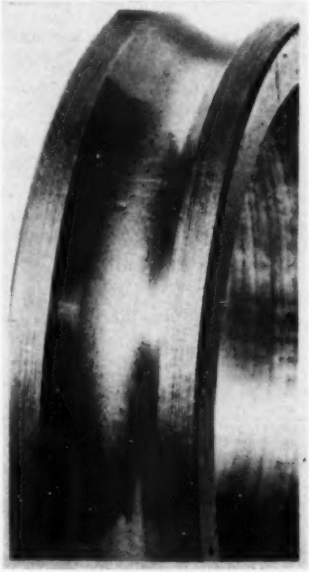


Photo: Marlin-Rockwell Corp.

Bearing damage caused by hard, coarse matter which has scored the surface

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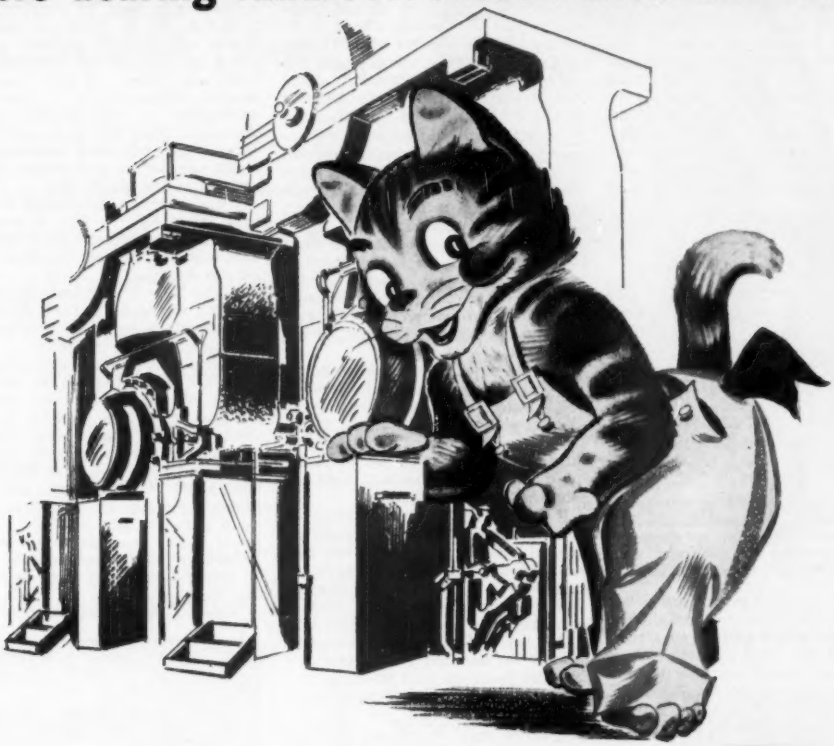

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hot light oil and drained. The bearing should be slowly rotated while being cleaned and flushed.

After cleaning, the bearing should be packed with grease between the inner and outer races, as shown in Fig. 2. The housing should also be filled one-third full.

The shaft seals should be checked each time a bearing is cleaned and, if defective, should be replaced with new ones. This is very important.

Between inspections and cleanings, ball bearings should be given additions of fresh grease at predetermined intervals, as already explained. When this is done, the bearing should be running, if possible, and the relief plug, if provided, should be removed. Grease should generally be added until fresh grease appears at the relief opening. Then the bearing should continue to run for at least 20 min. before the relief plug is replaced. This serves to prevent overfilling of the bearing housing.

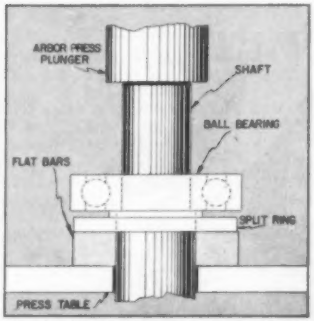

Fig. 5. Split rings may be employed to apply pressure to the inner race where conditions exclude flat bars

Where bearings are not provided with relief fittings, a predetermined quantity of grease should be introduced, as shown in Fig. 1. This predetermined quantity is determined by periodic checkups on the rate of grease consumption of each bearing.

When bearings are fitted with excess grease pressure relief fittings, as shown in Fig. 3, grease should be added only until it appears at the escape ports. This automatically prevents build-up of excess pressure within the bearing housing.

Where bearings operate at speeds above 4,000 rpm oil is generally preferred for lubrication, because most greases are likely to break down under these conditions. Such bearings are lubricated by spray, mist, bath, pressure feed or drip feed, according to bearing design. Some grease lubricated bearings are lubricated periodically with small quantities of oil to revitalize the grease.

Usually SAE No. 40 to No. 70 oil is employed for ball bearing lubrication, but particular operating conditions may require compounded or other types of oils. Oil must generally be replenished oftener than grease in ball bearings, sometimes as often as weekly or even semi-weekly.

Where oil bath lubrication is employed, the oil level should generally be maintained about even with the lowest point of the inner ring of the bearing, for slower speed operation; and approximately level with the center of the lowest bearing ball, for higher speed operation.

As with grease lubrication, excessive quantities of oil are detrimental to ball bearing operation, since churning will result and this will usually produce a temperature rise, especially at higher speeds.

It is well to periodically inspect oil level gauges, so as to discover bent pipes that may cause the oil level in the bearing to be too high or too low, because an exact oil level is generally necessary to proper lubrication.

Oil lubricated ball bearings should be periodically drained to remove deteriorated and contaminated lubricant, then flushed with light (spindle) oil, followed by one or two flushings with the regular lubricating oil used in the bearing, then refilled to the correct level.

If the bearing uses very heavy oil, or is extremely dirty, it should be flushed with an approved safety solvent, such as petroleum spirits, to remove the heavy oil and foreign matter, then flushed with regular lubricating oil as already described.

Oil for ball bearing lubrication should be handled and introduced into the bearings with the same degree of cleanliness as described for grease.

Bearing seals should be replaced whenever necessary, just as with grease lubrication. However, oil seals must necessarily be more effective than grease seals, therefore a bearing housing constructed for grease lubrication should never be lubricated with oil.

In handling and replacing ball bearings great care is necessary, to avoid damaging them or permitting abrasive dust to gain admittance. The importance of the latter precaution can better be understood when it is realized that more than ninety per cent of all ball bearing failures are caused by dirt. Surely no one would willingly expose the operating parts of a fine watch to the dusty atmosphere of a shop, yet the fit of ball bearing parts is of even greater precision.

When removing a ball bearing from a shaft always apply an even pressure to the inner race only, if possible. This may be accomplished in various ways, depending upon the type of bearing mounting. Where an arbor press is available, the bearing inner race should be supported by a pair of flat bars of exactly the same height, as shown in Fig. 4, or a specially shaped split ring, as shown in Fig. 5, where conditions will not permit the bars to support the inner race.

If an arbor press is not available, a length of clean pipe or tubing with square ends may be employed, as shown in Fig. 6. Moderate hammer blows should be applied to all sides of the end of the pipe, in order to drive off the bearing square. Sometimes it may be preferable to reverse the procedure and place the bearing on top of the pipe, driving carefully on a flat piece of brass or copper placed on top of the shaft end.

Under certain conditions a split ring, as shown in Fig. 5, may be required to transmit the hammer blows on the pipe to the inner race of the bearing.

There are a number of special bearing and gear pullers available, with various special attachments, that permit the removal of ball bearings that would otherwise be difficult or impossible to remove. Some of these pull the bearing through pressure applied to the inner race by the bearing housing end cover. Others pull the bearing by pulling a gear or other part from the shaft. Still others pull the bearing directly by means of multiple jaws or split collars.

Large ball bearings are sometimes heated by pouring hot oil over them to expand the race and loosen it on the shaft.

Where it is impossible to remove a ball bearing by applying pressure to the inner race, it will be necessary to apply pressure to the outer race, but this requires great caution. The pull must be square at all times and the load steady. Never hammer on the outer race as this is likely to ruin the bearing.

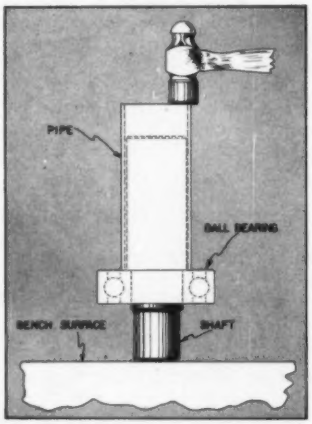

Fig. 6. When an arbor press is not available a length of clean tubing or pipe may be employed in place of it

(Continued on page 192)

the case of Miserable Mike

Mike was a darn good maintenance man.

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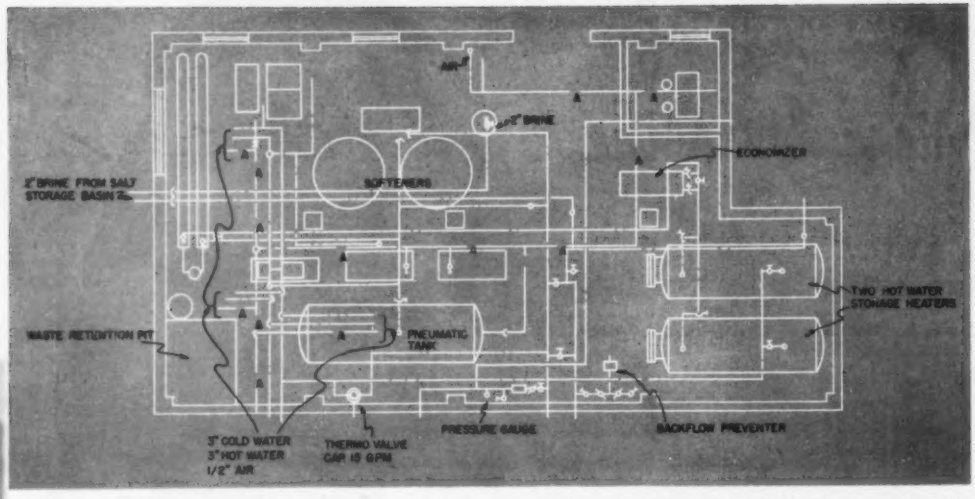

Diagram of air, hot water and cold water systems at Veterans' Administration Hospital laundry in San Fernando, Calif.

MAXIMUM HEAT RE-USE At VA Hospital Laundry

Curve in steam line from power house to laundry takes up most of expansion

PLANT ENGINEER E. E. Luder of the San Fernando Veterans Administration hospital believes that his institution's new, two story, 10,000 sq ft laundry is a pretty good example of heat re-use. Mr. Luder bases this contention on the laundry's system for squeezing the last ounce of usable heat from wash water and from steam return lines.

Like a lot of specialized plant laundries, the San Fernando facility has some problems all its own. One of these is the fact that every one of the more than 200,000 pieces of laundry processed monthly, comes form wards housing active tuberculosis cases. This means that laundry workers, at least in the primary sorting rooms, must wear face masks, wash their hands frequently in a 1 per cent chlorine solution, and handle bedding and clothing under germicidal lamps. But more important from the plant engineering viewpoint: this laundry, like others of its specialty, has a longer and hotter washing cycle. This, of course, is dictated by its institutional function. But because higher temperatures are used (from 10 to 30 degrees hotter), the engineering becomes a nice problem for maximum heat re-use.

The washing process requires a maximum temperature of about 180 F. The problem at San Fernando VA hospital is to raise city

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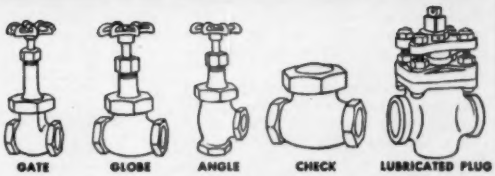

Bronze valves in gate, globe, angle, check, and lubricated plug types are manufactured by Walworth. Illustrated is a sectional view of a Walworth No. 225P Bronze Globe Valve. This valve has a working steam pressure rating of 350 psi at 550F (1,000 psi non-shock cold water, oil, and gas pressure). It features a renewable, plug type, stainless steel seat and disc, heat treated to 500 Brinell hardness.

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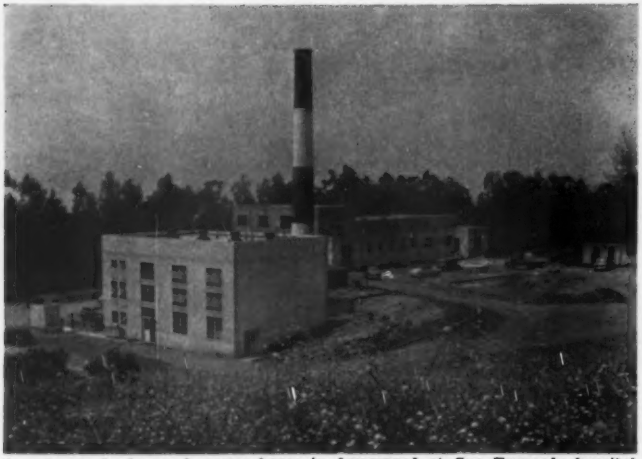


Laundry in background, power house in foreground at San Fernando hospital

water to this temperature and to do it as efficiently as possible.

Three stages are involved: First, raising city water to 100 F. This is accomplished in heat reclaiming units which are warmed by the discarded wash water from the washing machines. Second, from the heat reclaimers, the 100 F service water runs through coils in an economizer, which raises its temperature another 20 degrees, to 120 F. The economizer gets its heat from a condensate pump pit, which collects condensate from the various steam lines. Finally, the last 60 to 70 degree temperature raise is accomplished in two hot-water storage heaters. These units are the only ones in the entire process which use steam directly from the nearby power plant. All the heat needed to raise the city water to 120 F in the initial heating stages is supplied by either returned steam condensate or by heat-exchanger units drawing from the discarded wash water.

When you consider that the four washing machines in the plant change their water as often as 6 times per wash, it's pretty obvious that there's a lot of heat which would be wasted (and discharged to sewers) were it not reused. Also, because of the type of laundry it handles, the facility runs laundry through four rinses at 180 F.

The heat reuse process begins when city tap water enters a basement water conditioning room. This water, destined to be the plant's service water, is first softened in one of two zeolite, salt-regenerated softeners. Softeners have an exchange capacity of 252,000 grains and are capable of delivering 0-degrees hardness at the rate of 31,500 gph. This is based on the 7 to 9 grains hardness per gallon of San Fernando water.

A heat reclaimer pump circulates hot water from a close-at-hand waste retention pit through the heat reclaimers. The waste retention pit, which is 7 ft 6 in by 5 ft by 6 ft 6 in deep, is the sump into which all used water from the washing processes discharges.

The economizer has a capacity to cool 5500 lb of condensate per hour from 200 F to 120 F, when heating 42,000 lb of service water from 100 F to 110.5 F. The condensate pump pit, which collects condensate from the high pressure and medium pressure steam lines, is adjacent to the economizer, so that heat losses are minimized in the pipe-run to the economizer's coils.

Steam from the boiler house enters the laundry building at about 115 psi, and is reduced to two usable plant pressures: 100 to 105 psi and to 30 psi. The 105 lb steam is used almost exclusively in the laundry's nine pressing units.

The 30 lb steam is distributed to the washing machines, starch cookers, soap tanks, to two hot water heaters (storage tanks) and to other units. All condensate, with exception of that from the 30 psi unit heaters, eventually find their way to the condensate pump pit. Condensate entering the economizer at approximately 200 F, and losing about 80 deg through the unit, is then returned to the boiler plant via a 2-in. copper line. Meantime, the 100 F service water has been raised approximately 10 to 20 degrees and is ready for its third and final heating phase, which takes place in the two, 48 in. by 168 in. hot water storage heaters. These heaters, supplied with 30 psi steam from the boiler plant, raise the service water temperature to the desired 180 degrees F.

This means, of course, that boiler room steam is only required in the final heating phase, and it also means a maximum reuse of the plant's discharge heat.

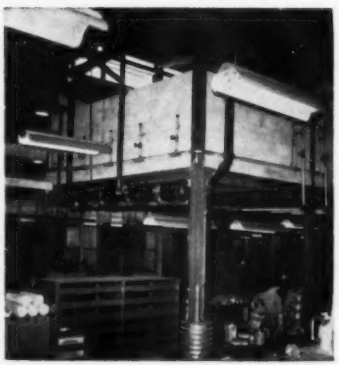
Heated to 180 F, the service water is discharged to the various washing units on the floor above after first passing through a 60 in. by 192 in. pneumatic tank. The pneumatic tank absorbs some of the shock caused by rapid filling from the system.

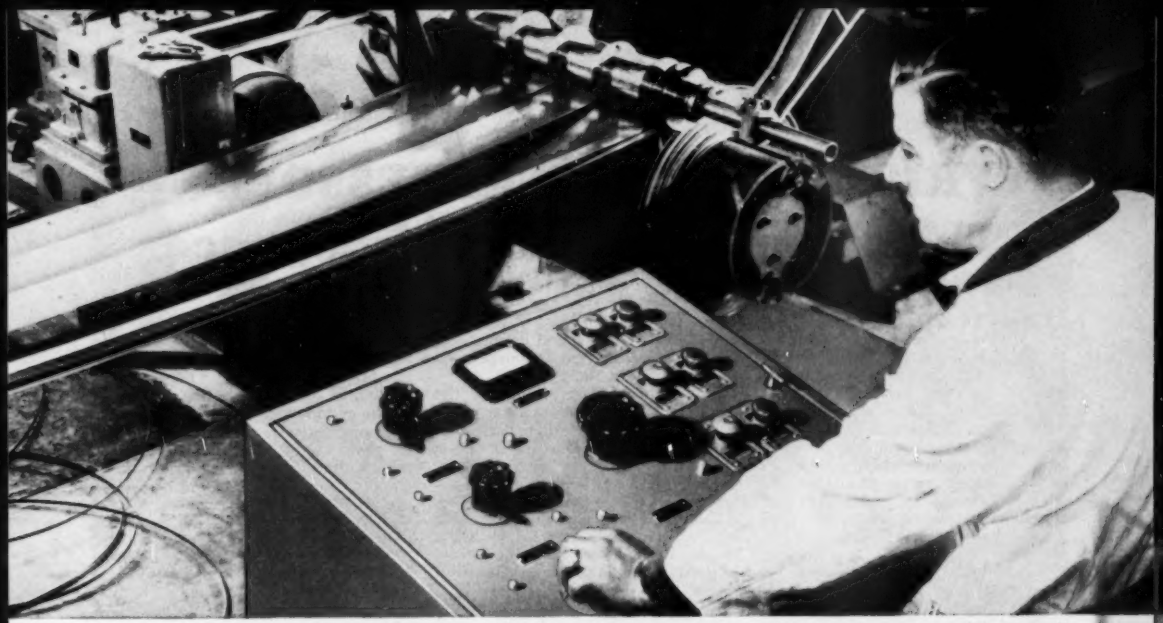
Plant Engineer Luder believes that this essentially simple system of heat reuse promises easy maintenance since only a minimum of steam from the original boiler-plant source is used. Also, there are fewer high pressure steam lines to clutter up the service water processing room.

This system will insure, that despite a much larger laundry than the one now operating at the hospital, the power house and its three, 3-drum Erie City Iron Works boilers, will not need more capacity than at present. Mr. Luder also presided over installation during the last two years of two new boilers.

Plenty of Room "Upstairs"

Plants with plenty of "upstairs" space, such as in high bays, find it adaptable to many uses—new heating facilities, conveyors, mezzanine storage areas, and even washroom facilities, as this view in Twin Coach Co.'s Kent, O., plant well illustrates. Plumbing for such facilities is vastly simplified, too, when pipes and fittings, as shown, can be installed along exterior facings, and below the "upstairs" floor level.





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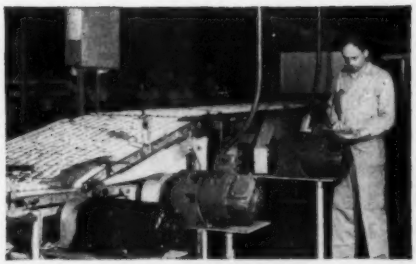

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GENERAL ELECTRIC

REFRIGERATION COMPRESSORS — Their Operation and Maintenance

THE USE OF COMMERCIAL refrigeration is increasing steadily, notably in the industrial field, where process refrigeration has made great strides. Coupled with this are the advances being made in the design and construction of refrigerating equipment, especially compressors. These factors make it necessary for plant personnel, particularly operating and maintenance crews, to be informed on the latest trends. But since a considerable portion of existing refrigerating equipment is of an older style, it is important that it be understood also. Hence it is the aim of this article to treat of all types of refrigerating equipment.

Refrigerating compressors employed commercially are generally of the reciprocating and centrifugal or turbo types. Reciprocating compressors are divided into vertical, horizontal and radial styles. The vertical machines are further classified as in-line, Fig. 1, and V and W cylinder groupings, Fig. 2. The horizontal machines are classified as single cylinder and two cylinder types, Fig. 3. The radial machines are classified as single and double cylinder groupings, Fig. 4.

Cylinder types are divided into single acting, in which the refrigerant gas is compressed in only one end of the cylinder, and double acting, in which the gas is compressed in both ends of the cylinder.

Some compressors compress the gas in two stages, having a low pressure and a high pressure cylinder. Two-stage compression is also accomplished by using separate compressors, the low pressure machine being called a "booster" compressor.

Compressor discharge valves are located in the cylinder heads, while the suction valves may be located in the cylinder heads or in the piston heads.

Reciprocating compressors employ several methods of preventing escape of gas past the drive shaft, fibrous or metallic ring packing in an adjustable stuffing box; metallic or composition rubbing sealing surfaces (called shaft seals); and by eliminating the need for a shaft sealing means by enclosing the drive motor within the compressor housing. The latter type of compressor is generally termed a hermetic unit.

Splash oiling of the cracks, pistons and piston pins is utilized in some types of reciprocating compressors, while the shaft bearings are force feed lubricated from an oil pump driven by the shaft. Other types are full pressure lubricated. Strainers are usually provided in the oiling systems, and some systems are equipped with oil coolers. Open type compressors are usually fitted with individual or group oilers.

The cylinders of larger reciprocating compressors are usually cooled by water circulating in jackets to absorb the heat produced by the compression of the gas. However, the cylinders of some compressors are cooled by oil forced into the cylinder, or by a small amount of liquid ammonia injected into the cylinder. Smaller compressors are often arranged for air cooling of the cylinders.

Centrifugal compressors are similar in design to centrifugal pumps, compressing the gas by means of centrifugal force converted into pressure. Usually two or three stages of compression are employed and the machine rotates at high speed.

Reciprocating compressors are used for small and medium refrigeration loads, while centrifugal compressors are generally used for large loads.

Reciprocating compressors may be either belt driven or direct connected, and may be powered by steam, Diesel or gasoline engines, or electric motors, the capacity of the compressor generally being varied to suit load conditions by varying the speed of the prime mover, utilizing slip type couplings, or by means of hand or automatic unloading of cylinders, accomplished by blocking open the suction valves.

Centrifugal compressors are direct driven by steam or gas turbines, and gear driven by electric motors or Diesel or gas engines. Constant speed electric motors combined with magnetic or hydraulic slip couplings permit variations of compressor speed either manually or automatically. Capacity variation is accomplished by variation of the speed of the drive, or by impeller suction control through adjustable dampers or guide vanes.

Centrifugal compressors usually employ a type of shaft seal that operates in oil, to provide lubrication and sealing. Some of these are metal-to-metal seals; others, carbon to metal.

Centrifugal compressors are pressure lubricated from self-contained oil pumps, and filters and coolers are provided in the oiling system.

Reciprocating compressors for

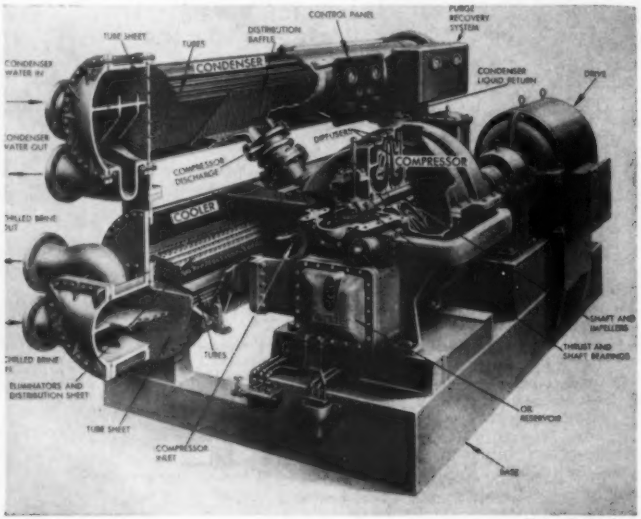

Photo: Carrier Corp.

Cut-away picture of large centrifugal refrigeration unit showing the interior

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Drive at pug mill of Gladding McBean & Co. Safety guard removed for photographic purposes

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ammonia usually are equipped with bypass manifolds, Fig. 5. This arrangement permits refrigerant to be properly controlled, and to be transferred from one part of the system to another as required. Referring to Fig. 5, in normal operation, discharge valve (A) is open and permits discharge gas from the compressor discharge port to enter the discharge pipe, while suction valve (D) is open and permits suction

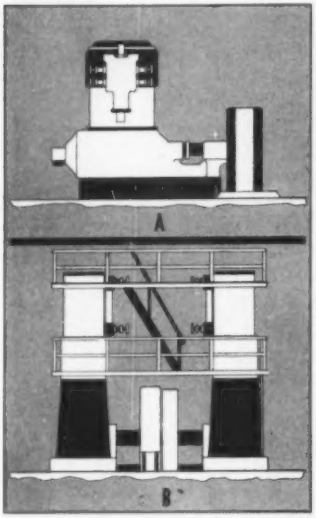

Fig. 1. Top: Typical two-cylinder single acting compressor. Bottom: Two cylinder double acting compressor

gas from the suction pipe to enter the compressor suction port. Bypass valves (B) and (C) are closed.

Reversing the valve positions, discharge valve (A) and suction valve (D) are closed. Bypass valve (C) is open and permits discharge gas from the compressor discharge port to enter the suction pipe, while bypass valve (B) is open and permits suction gas from the discharge pipe to enter the compressor suction port.

Reciprocating compressors employ suction and discharge valves of several types. Suction valves located in the head of the piston are generally of the poppet type, similar to automatic engine valves in general design. Some compressors also employ poppet type discharge valves. Plate type suction and discharge valves consist of thin strips of flat metal termed "feather valve strips," held loosely in place by guards that permit the proper degree of operating movement. Ring type plate valves are similar to "feather valves" but are circular in shape.

Larger, older type reciprocating compressors employ heavy flywheels to smooth out the piston strokes and even the load on the driver, but modern, smaller multiple cylinder compressors are balanced to such an extent as not to require flywheels.

In starting a refrigerating compressor of the reciprocating type having a manifold but not equipped with an unloader, first turn on the condensing water and the jacket water. Where an economizer is employed, start this. Next open all valves between the compressor and the condenser. Then see that manifold valves (A) and (B), Fig. 5, are closed, and open by pass valve (C) wide, and suction valve (D) a half turn. Start the compressor, and as soon as it reaches full speed, open discharge valve (A) wide and close by pass valve (C) at the same time. Then open suction valve (D) slowly. Open the valve to the automatic or hand expansion valve or float regulators. If a hand expansion valve is used, open this cautiously, to prevent liquid slop-over into the compressor.

Where the compressor is equipped with suction and discharge valves only, in starting, open the discharge valve wide, and the suction valve a half turn. When the machine reaches full speed, slowly open the suction valve.

Where two or more compressors are operated at the same time but one or more is shut down at times, when starting an idle machine, apply the load slowly and gradually, by throttling the suction valve, so as to avoid liquid slop-over caused by rapid evaporation when the additional compressor is thrown on the line too suddenly.

In shutting down the compressor, unless a high pressure float regulator is employed in the liquid line from the receiver, close the receiver liquid outlet (King) valve. Next close suction valve (D), and immediately stop the compressor. Then close discharge valve (A).

In opening wide compressor suction and discharge or manifold valves of the back seat type, the valve should be turned a half turn closed again, in order to avoid the possibility of trapping liquid refrigerant in the space between the back seat and the valve bonnet stuffing box, with possible resultant breakage of the valve bonnet.

It is also advisable to slacken the packing nut slightly before turning a manifold or other refrigerant valve wheel, in order to prevent unnecessary wear of the valve stem packing. However, make sure the packing nut does not turn with the valve stem. Always tighten the packing nut moderately afterwards.

The flow of cooling water to the compressor should be regulated so that the temperature of the water leaving the jacket is maintained at 95 F.

In order to open some part of the refrigerating system for inspection or repairs and yet avoid loss of the refrigerant to the atmosphere, it is necessary to pump the refrigerant to a part of the system that can be valved off or isolated.

To pump out the low side of the system, that is, the evaporator and the piping between the expansion valve or float regulator and the compressor suction valve, simply close the liquid line (King) valve at the receiver and run the compressor as in normal operation until a vacuum of at least 26 in. is obtained, then stop the compressor and close the suction and discharge valves in the normal manner.

Wait a short time after the compressor is stopped before opening the pumped-out part of the system, to see whether the gas pressure will build up again. If so, start the compressor again, as usual, and pump out the low side of the system as before. Do this as often as necessary until the gas pressure ceases to build up.

Never attempt to open any part of a refrigeration system, or remove a plug, or disconnect a line without wearing goggles, because refrigerant may be discharged without warning and all refrigerants are dangerous to the eyes.

Where a low pressure switch or thermostat controls the compressor motor, this must be blocked in the running position to prevent it from stopping the motor.

It is important to make sure that the receiver is large enough to hold

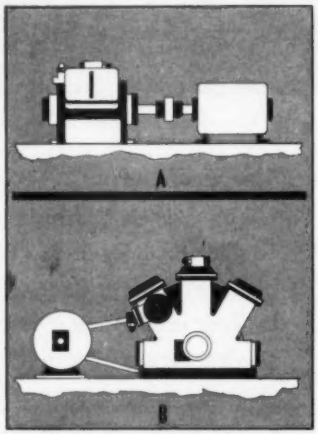

Fig. 2. Compressor at top is of V-cylinder grouping type. Unit at bottom of drawing is W grouping type

the refrigerant from the low side of the system. The refrigerant liquid level should usually not rise above 80 per cent of the height of the receiver, as indicated in the gauge glass. If the receiver is not equipped with a gauge glass, watch the condensing pressure closely while pumping out the low side. When this pressure begins to rise it indicates that the receiver is full

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and the liquid is backing up in the condenser, thus reducing the effective condensing surface. In such a case, transfer some of the refrigerant into an empty refrigerant cylinder.

Where the evaporator is a shell and the tube liquid cooler, be sure to circulate liquid through the tubes freely to prevent their freezing.

When it is necessary to pump out the condenser, close the receiver outlet (King) valve, and operate the compressor to pump out the evaporator slightly, then stop the machine. Next close the liquid stop valve between the condenser and receiver, and the valve in the equalizing line between the condenser and receiver. If a check valve is installed in the gas line between the compressor and condenser, open it by turning the opening stem clockwise. Next shut off the condenser cooling water, and if a closed condenser, drain out all water to prevent its freezing in the tubes. Next close the compressor discharge and

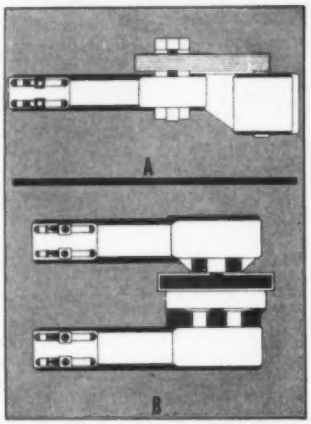


Fig. 3. Top drawing shows horizontal single cylinder double acting compressor (top view). Drawing at bottom is horizontal double acting unit

suction valves (A) and (D), Fig. 5, and open bypass valves (B) and (C), also open any valve in the suction line between the evaporator and compressor. Next operate the compressor until a 15 inch vacuum is obtained in the condenser. Then stop the compressor, and close bypass valves (B) and (C) immediately after the machine comes to rest.

Be sure that the receiver does not fill completely and that sufficient gas space exists above the liquid.

If a high pressure float ammonia regulator is employed to drain the condenser, close the liquid stop valve between the condenser and float regulator and proceed as already explained for pumping out the condenser.

Where the condenser is also used as a receiver, if the evaporator has insufficient capacity to hold the refrigerant in the condenser, with additional gas space above the liquid for safety, the surplus refrigerant must be drained into empty refrigerant cylinders before pumping out the condenser.

Be sure to carefully weigh refrigerant cylinders before and after filling, in order to prevent overfilling, as a safety precaution.

To pump out the liquid receiver, close the valve between the condenser and receiver and open wide the expansion valve or the bypass valve around the float or thermal expansion valve. If this fails to exhaust the liquid from the receiver, operate the compressor with the suction valve (D) throttled, have plenty of cooling water flowing through the condenser, and allow liquid refrigerant to build up in the bottom of the condenser. In the case of ammonia, determine whether any liquid remains in the receiver by purging from the receiver drain valve through a hose into a bucket of water. Liquid will cause a loud crackling noise; gas, steady bubbles.

The compressor should be stopped when the high pressure gauge shows the condenser pressure to have risen to within 20 lb of the relief valve setting.

To pump out the compressor crankcase for inspection, operate the machine as usual, with discharge valve (A), Fig. 5, open but with suction valve (D), closed. Then open the pump-out valve. Check for vacuum in the crankcase by opening the crankcase oil inlet valve and placing a finger over the valve opening. When a vacuum is indicated, stop the compressor and close discharge valve (A). When the compressor is operating normally, the pump-out valve should be closed.

To pump air from the condenser after repairs have been made, close discharge, suction and bypass valves (A), (D), and (C), Fig. 5, then open bypass valve (B). Next remove the plug from the purge opening in the manifold or top head, and operate the compressor until a 25 in. vacuum is obtained in the condenser. Then stop the compressor, and as soon as it stops, replace the purge plug, and close bypass valve (B).

Air may be pumped from the compressor after inspection by closing discharge and suction valves (A) and (D), removing the purge plug, and operating the compressor for only a few seconds to evacuate it. Then stop the compressor and replace the purge plug.

In the case of some smaller compressors, the flare nut in the connection from the discharge manifold to the high pressure cut-out switch is loosened to pump air from the compressor.

Lubricating oil may be added to the compressor crankcase on larger machines by attaching a hose to the oil charging valve (which also is the oil drain valve) and placing the end of the hose in a clean bucket of refrigerating compressor oil, then pumping out the crankcase, as previously described, until a vacuum is obtained, after which the oil charging valve is opened to permit the oil to be drawn into the crankcase. Do not allow air to be drawn into the hose. The oil level should be kept at the height recommended by the compressor manufacturer.

Centrifugal compressors are provided with an oil reservoir, oil cooler, and sometimes an oil heater.

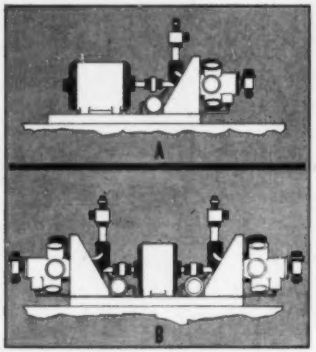


Fig. 4. A seven-cylinder radial single compressor is shown in top sketch; 14-cylinder double radial unit at bottom

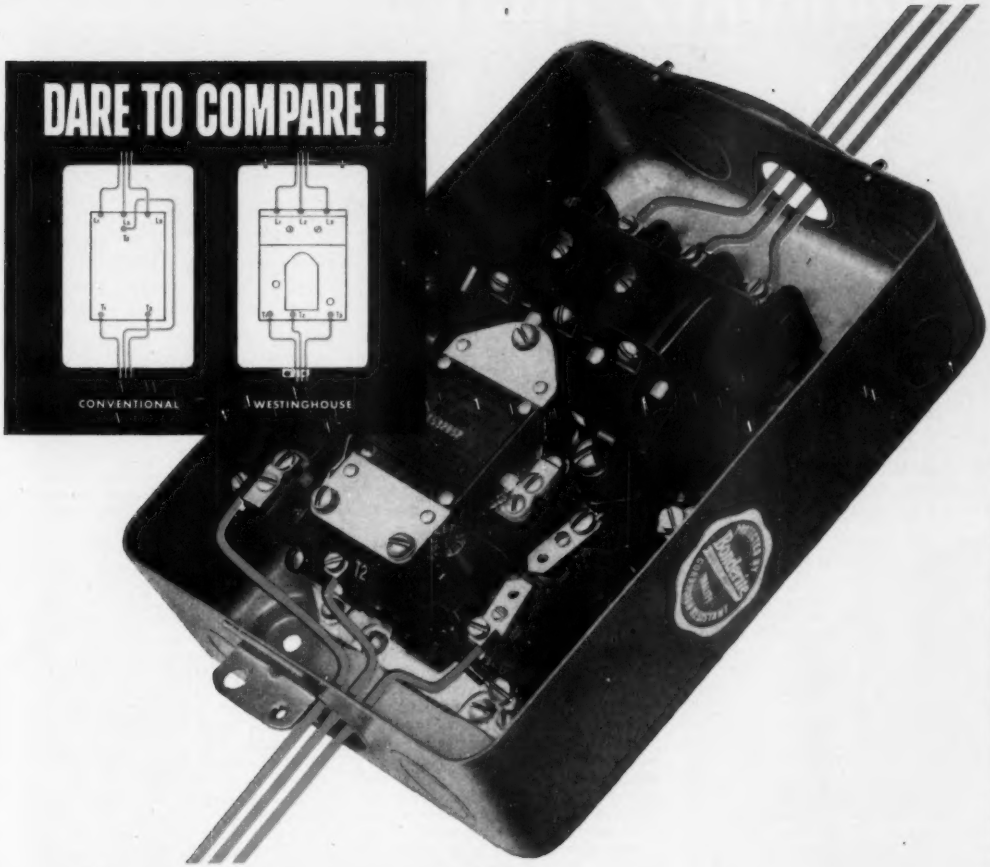
Some compressors are charged by using a hand oil pump.

On force feed lubricated compressors, the oil pressure should be noted periodically and bearing temperatures checked. Some machines are equipped with bearing temperature thermometers.

The shaft or rod packing (where used) should be kept just tight enough to prevent refrigerant escape, though an occasional drop of oil should be permitted to flow through the packing for lubrication. When the compressor is shut down, the packing will require a slight tightening to prevent leakage caused by contraction of the shaft or rod. Tighten only two gland nuts, however. Be sure to slacken the same nuts to running position when starting the machine.

Where a shaft seal is used, check this periodically for evidence of refrigerant or excessive oil leakage.

About once a year, the compressor crankcase should be pumped out, as already explained, and the purge plug removed, after loosening it to release gas pressure. Remove the crankcase cover plates and the cylinder heads. Then drain the old oil and thoroughly clean out the crankcase. Next wash the safety heads and valves in clean refrigerating oil, and check the condition of the valves and springs. Sometimes a loose nut on a piston poppet valve



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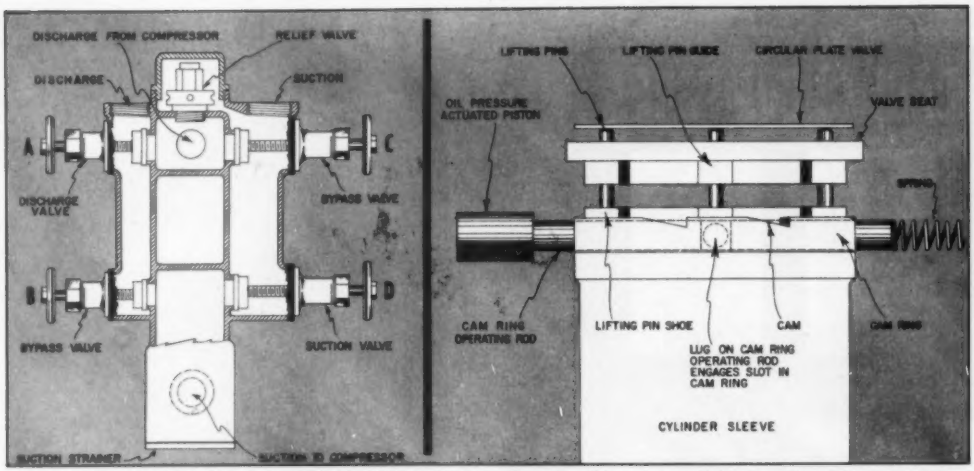


Fig. 5. Left: This is drawing used in text of article to describe operation of by-pass manifolds on reciprocating compressors
Fig. 6. Right: Points to be checked on reciprocating compressors having automatic unloaders for starting or capacity control

stem will prevent the valve from cushioning properly and will cause a loud noise when the compressor is operating. Also make sure the nuts on the connecting rod bolts are tight. Then refill the crankcase with fresh oil and replace the cover plates and cylinder heads. Remove the cover of the scale trap and clean the trap thoroughly.

With all parts replaced, except the purge plug, start the compressor with the crankcase valve open, so that the air will be exhausted from the crankcase and cylinders. Then stop the compressor and replace the purge plug. Close the crankcase valve and open suction valve (D) enough to allow sufficient refrigerant into the compressor to determine whether all joints are tight. Check the condition of the shaft and packing (if used) and see that the shaft is properly aligned in the stuffing box, and replace the packing if necessary.

Of course, worn out packing must be replaced whenever necessary, whether at compressor inspection or not. Be sure to use a satisfactory type and see that the lantern is placed so as to be immediately under the lubricant opening when the packing is normally compressed. Avoid tightening packing more than necessary.

Check the compressor drive equipment, and drain, flush and replace lubricating oil.

At periodic intervals of up to several years, depending on severity of service, when the compressor is opened as explained, check the condition of all operating parts. Take micrometer measurements of cylinders and wrist pins and compare with manufacturer's original dimensions; check cylinders for scoring or lack of lubrication, and piston rings for wear sufficient to permit the ends to stand open and allow excessive gas leakage; check pistons to see that the rings move freely in the grooves but have no movement in the direction of piston travel; examine connecting rods, and take up bearing wear (if any) by removing liners; and replace or recondition leaky or defective suction and discharge valves and parts.

Check the condition of the oil pump (if used) and the entire lubrication system, and make sure no obstruction exists. See that the safety relief valve is in operating order. If not, replace it with a new or factory reconditioned relief valve. Do not try to repair such valves on the job. Check the suction, discharge and bypass valves for leakage and defective operation, and repack if necessary; clean all strainers; and see that foundation bolts are tight and machine guards are in order.

Be sure to turn over the compressor by hand several times before starting it to be sure all parts operate properly.

On horizontal compressors, examine also the piston rod for shoulders, wear and scoring, the crosshead shoes and the crosshead and crank pins for wear, and the bearings for wear, misalignment and other faults. It may be necessary to adjust the crosshead shoes to align the crosshead center line with the cylinder center line.

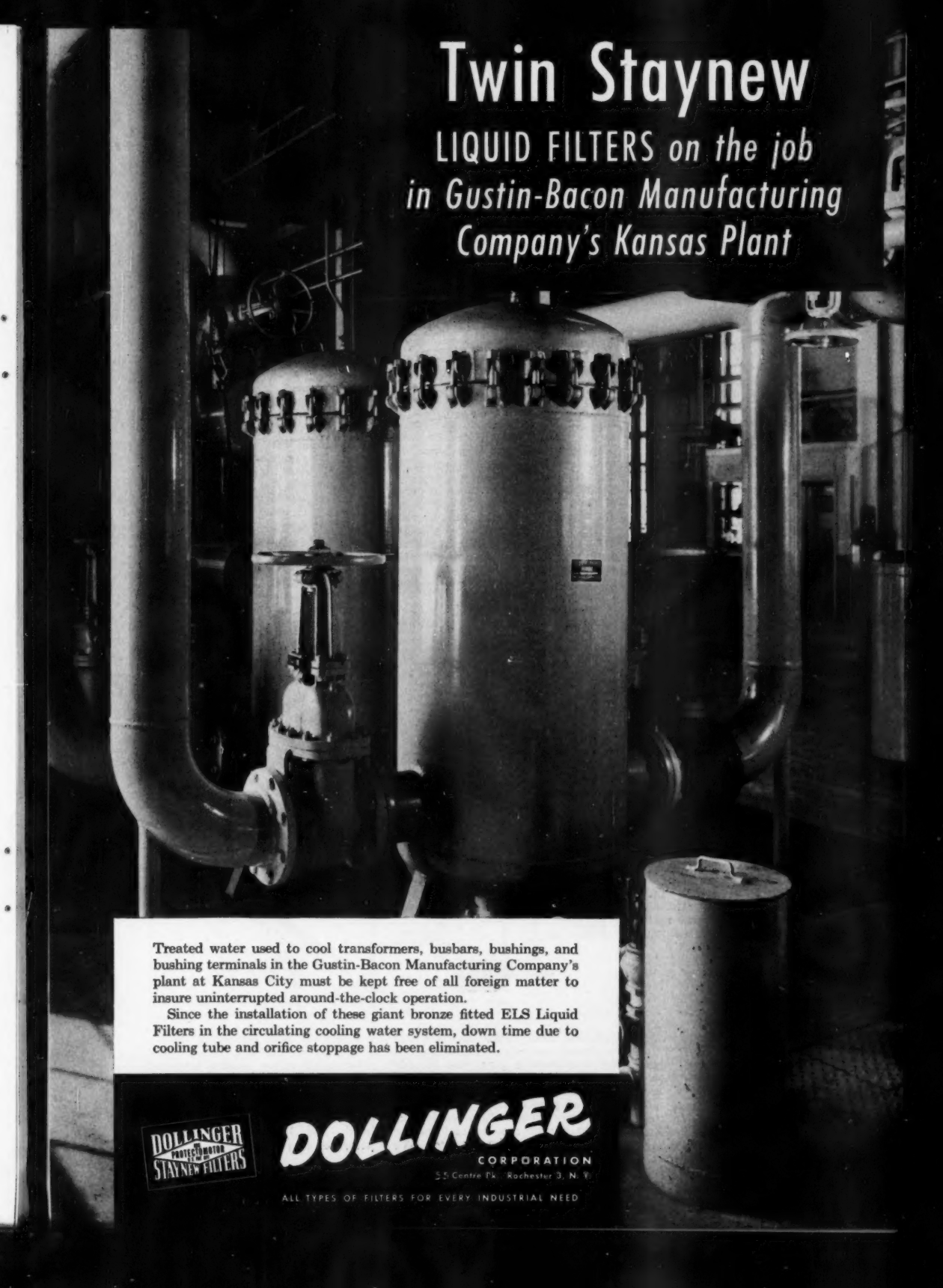
On centrifugal compressors, practically the only wearing parts are the main bearings, thrust bearings and shaft seal, all of which are usually arranged for easy replacement. See that the suction damper or compressor guide vanes are in satisfactory working order.

If a reciprocating compressor is direct connected, check for uniform clearance between the stator and rotor of the motor, the condition of the coupling, and the condition of all electrical equipment of the motor, wiring and controls. If belt driven, check the belt or belts for wear and defects, and clean if necessary; check pulley grooves for wear and examine the pulleys for tightness on the shafts. Check motor bearings for wear, and drain, flush and refill with fresh oil, and see that the rotor air gap is uniform and that the windings are free of dirt and oil deposits.

On centrifugal compressors, if direct connected, check the motor or other power source, as previously mentioned, and see that all parts are in alignment and tightly bolted in place. If a gear increaser or magnetic or hydraulic coupling is employed, check for alignment, and for proper adjustment and condition of lubricant or fluid. Where a separate purge compressor is included, check this in the same general manner as described for reciprocating compressors.

On reciprocating compressors that employ automatic unloaders for starting or capacity control, Fig. 6, check for proper operation of these parts. See that moving parts are not worn sufficiently to interfere with proper functioning. Make sure that springs are not broken or otherwise defective, and that when operating, the compressor unloads promptly in accordance with capacity requirements.

Since refrigeration is generally employed to protect valuable perishable products, or to maintain necessary temperatures in extensive manufacturing processes, its reliability is highly important. For this reason, proper operation and careful adherence to a program of regular periodic maintenance are essential.



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SELECTION, USE AND CARE OF TOOLS

Vises — Several important features which should be considered when selecting a vise for a particular job are mentioned in this article

By THOMAS TRAIL, Maintenance Engineer

VISES ARE MADE in a variety of types, sizes and constructions. In order to intelligently select one, it is necessary to consider the work it will be required to handle and to know the characteristics of available vises.

For general shop work, a substantial vise having jaws 4 to 6 in. wide is usually suitable. Where it will not be necessary to shift the position of work in the vise, a vise having a stationary base is preferable as it will be more sturdy and rigid than a swivel base vise.

However, where a swivel base vise must be selected, it is well to choose one having a corrugated base and clamp bolt, as shown in Fig. 1. This arrangement serves to prevent slippage of the base when force is applied to the work in the vise.

Figure 1 shows the tapered and corrugated clamp bolt, which is attached to the movable half of the vise base. This clamp wedges tightly when drawn up by rotation of the vise base clamping handle.

Consider These Features

In selecting a vise, consider quality, since a vise is generally used over a period of years and the cost per year of the best vise is relatively small when compared with its importance in handling shop work. It is therefore well to look for a long-life feature such as the buttress type screw thread, Fig. 2, instead of the conventional square thread. Buttress thread is 50 per cent stronger, and this extra strength and metal is at the root of the thread, the point where square thread is most likely to fail.

Another desirable feature is the support provided by a heavy, long horn, as shown in Fig. 3. This gives the movable jaw the support and rigidity necessary when large work is held in the vise and the jaws are open wide.

Other features that are well worth seeking in a vise are heavy construction, with the castings preferably of semi-steel; a very heavy anvil surface on the back jaw, which, though not intended to be used as an anvil, will help prevent breakage in the event the vise is so abused; tempered tool steel jaw facings, welded to the jaws of the vise, so that they will not loosen in use. In addition, a compensating feature should be considered for the wear between the front jaw and the shoulder of the operating screw, so that the necessity for turning the handle a half turn or more in order to start opening the jaws is eliminated; and, on a combination vise, which is equipped with pipe grips, grips should be arranged so as not to project beyond the face of the vise jaws, so that it is unnecessary to remove the pipe grips in order to hold regular work in the vise.

Where special types of work, or a combination of types, have to be handled, other types of vises will be found desirable. These include the combination pipe vise already mentioned; the plumber's hinged vise, that will handle a considerable range of pipe sizes, see Fig. 4; the steamfitter's vise, with movable back jaw to permit pipe to rest on the work bench; the flat type vise, for use in holding work on the drill press or the milling machine; and the sheet metal worker's and woodworker's vise, see Fig. 5, with extra long jaw travel and tall jaws that permit large work to be gripped more firmly.

In mounting a vise, see that the material to which the vise is attached is of sufficiently heavy construction and rigidity to withstand the strains to which the vise will be subjected, and bolt the vise in place securely. Locate the vise at such a height as will permit average work held in it to be worked on comfortably by a workman of average height. Also, see that the location selected for the vise will permit all kinds of work for which the vise is to be used to be handled more conveniently.

In use, do not subject the vise to strains beyond its capacity. Do not use it for an anvil or heavy metal bending machine, or employ it as a heavy-duty press or jack. Clamp work securely, so that it will not slide between the jaws and dull or wear the jaw facings needlessly.

When clamping polished, plated or otherwise finely finished material in a vise, be sure to have the jaw surfaces covered with brass or lead caps to prevent damage to the material. Vise caps may be obtained from dealers handling vises or may be fashioned in the shop from sheet material, see Fig. 6.

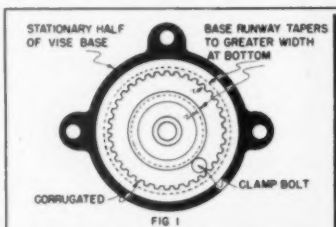

FIG. 1

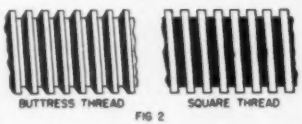

FIG. 2

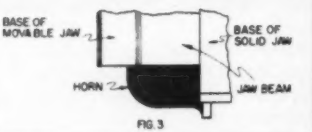

FIG. 3

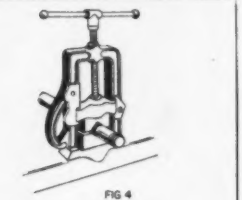
FIG. 4

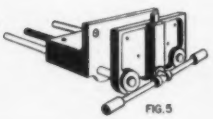
FIG. 5

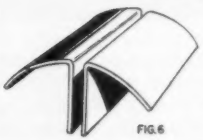
FIG. 6

Apply a few drops of heavy motor oil to the vise threads and other rotating or sliding pressure points weekly. It is well to disassemble the vise once a month and remove any dust, grit, metal chips and rust that may have accumulated, and lubricate the moving parts before reassembly.

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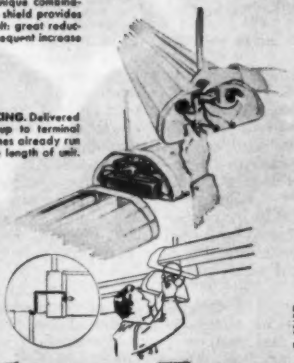

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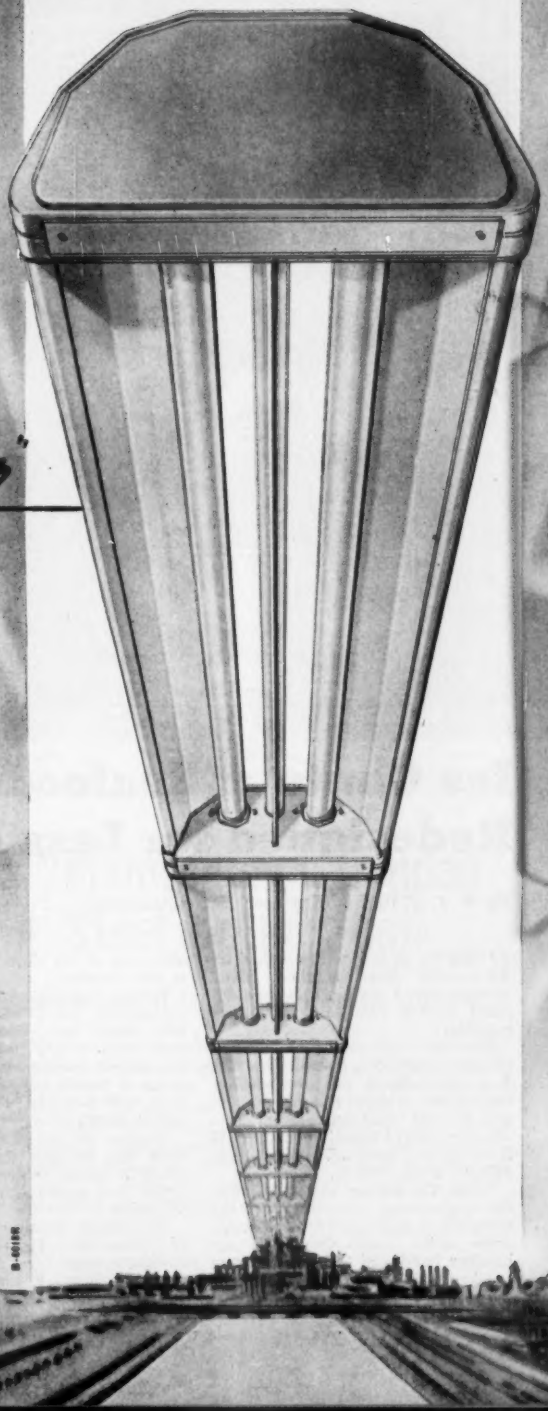


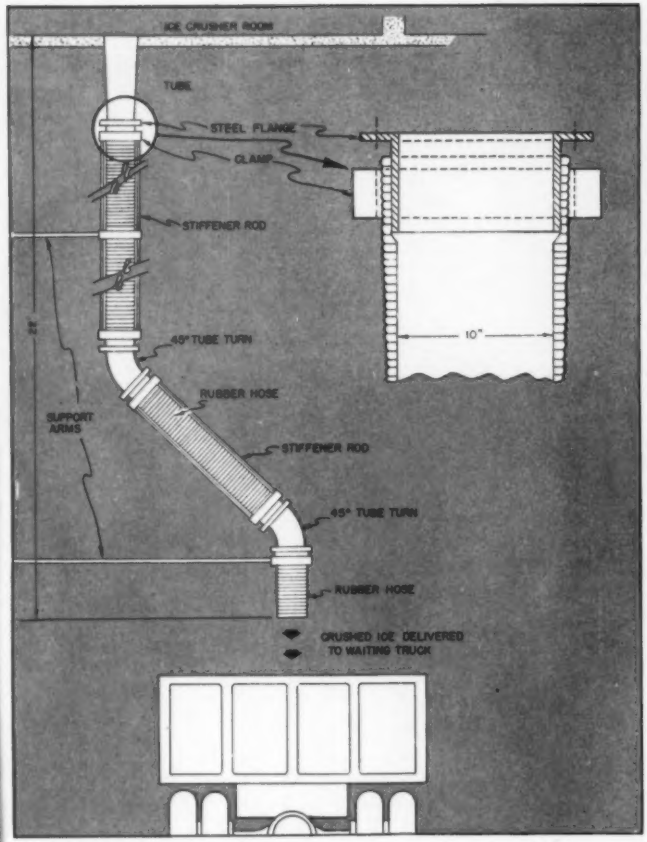


Diagram of ice chute shows the use of three lengths of rubber hose and the two 45 deg turns which have reduced the vibration of the chute sides and eliminated the roar which was heard previously, making normal conversation difficult. Cross section, upper right hand corner, shows how the rubber hose section of ice chute is clamped to flange

Before, crushed ice, roaring down five floors of sheet metal chute, made conversation impossible within 100 ft. . . . Redesign of chute and use of rubber hose eliminates vibration of chute sides, permits normal conversation near chute

Ice Chute at Seafoods-Boston Is Redesigned for Less Noise

By V. J. STUMPP, Engineer, Seafoods-Boston

EVER try to talk with crushed ice roaring down a sheet metal chute nearby? Seafoods-Boston decided that it was just about impossible.

The ice chute on the fish pier delivers crushed ice from the fifth floor to trucks in the street below. During the summer it is often operated several times every hour. Conversation was impossible within 100 ft of the old sheet metal chute and difficult within 200 ft.

When the matter was put before the engineering department of the company, it was found that, although some noise came from the ice breaker itself and the shattering of the ice as it piled up in the truck, vibration of the chute sides was the worst offender.

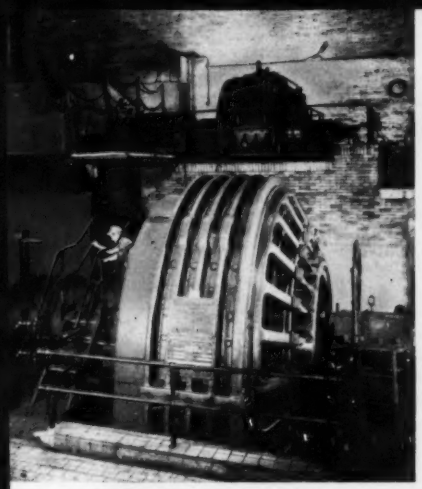
It was impractical and costly to reroute the ice. Coating of the outside would have been costly as a new chute would have to be built for proper adherence. To line the chute it would have had to be rebuilt with a vertical flange along its entire length to fasten the lining.

Finally, the use of a 10 in. rubber hose was decided upon, both because it meant lower over-all expense and would best absorb wall vibration.

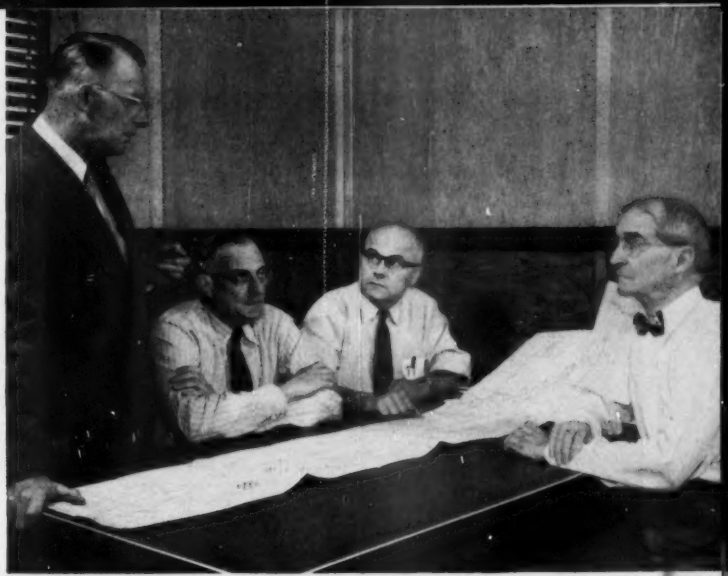
The chute consists of 3 lengths of rubber hose. It has an abrasion-resistant inner core mounted on a fabric rubber impregnated base. This, in turn, is wired and covered with weather-proof coating.

In assembly, flanged nipples were made of 10 in. pipe and the whole unit bolted together. Where the chute changes direction, a heavy-walled 45 deg flanged steel elbow was used. It is expected that this new elbow will give much more life than the 2 years of life of the former sheet metal tubes.

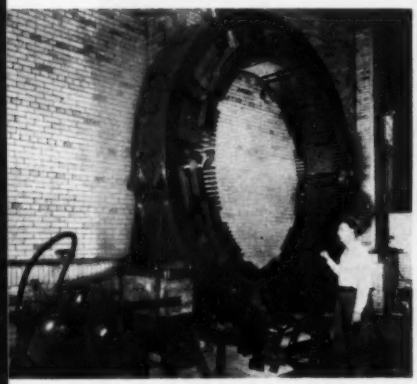
The chute has performed better than expected. It is now possible to talk normally in the immediate area. No sound reaches the adjoining office spaces. With this newly designed ice chute, it is expected that work fatigue in the area will be cut considerably.



Complete spares are kept for these key motors—a 7000-hp reversing-mill drive motor and the slabbing mill's 1650-hp d-c screwdown motor.

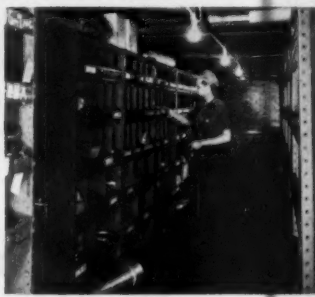


Wheeling Steel's equipment reconditioning program at Steubenville was planned by its superintendent in charge of operation and maintenance of electric equipment, James Farrington (right). Helping him are (right to left) George Merrick and Henry Ford, assistant superintendents, and (standing) Karl J. Doll, manager of the G-E Apparatus Service Shop in Pittsburgh.



Ready to replace any of 3 generators in the plant's main motor-generator set (already reconditioned) is this spare 2400-kw generator frame.

Motor pool comprises smaller spare motors, all reconditioned. Full information on each motor and its location is maintained in an equipment record system.



Standby renewal parts for electric equipment are kept in this storage room, one of several at Wheeling.

***Productive* Maintenance** "kit" contains helpful maintenance literature, plus "tools" that help sell management on need for full maintenance program.

Management is "Maintenance-minded" at Wheeling Steel Corporation

Here's how to develop management support for <u>your</u> maintenance program

Wheeling Steel Corp., of Wheeling, W. Va., shows what maintenance men can really do with full management support. "Our successful maintenance program," says J. H. McElhinney, operating vice president, "was devised and supervised by our maintenance department", and plays a major part in keeping output high.

To help *you* present your maintenance story to the top men in your plant, General Electric offers a new *Productive* Maintenance program. Its spearhead is a kit of maintenance information that helps you *prove* how Productive Maintenance can raise *your* plant's output. For your kit, contact your nearest G-E Apparatus Service Shop or write to General Electric Co., Section 801-8, Schenectady 5, N. Y.

GENERAL ELECTRIC

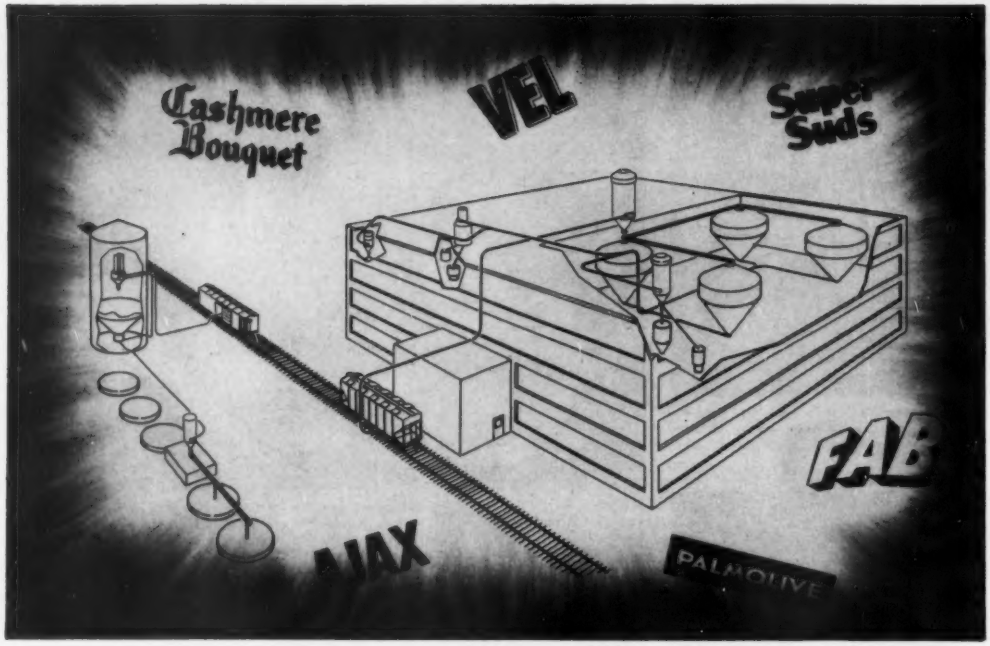


Diagram of Dracco system at Colgate's Jeffersonville plant where the "Airstream" Conveying technique has been used over 15 years. Main "in-plant" system unloads to storage (at 12½ tons/hour), withdraws from storage and transfers to production (at 5 tons/hour).

MASS HANDLING *Cleanliness* AT COLGATE

At their Jeffersonville (Indiana) soap and detergent plant, the Colgate-Palmolive-Peet Company utilizes Dracco "Airstream" Conveyors extensively to simplify bulk materials handling.

Soda ash, tetra-sodium pyrophosphate and other chemicals are unloaded to storage from railroad cars by the "Airstream" system. The same system also transfers materials from storage to process equipment, thereby eliminating many manual operations and improving production economy.

Throughout the plant the Dracco materials handling equipment has been designed to integrate smoothly with Colgate's manufacturing operations. The three Dracco Receivers in the distribution system were strategically placed over the three separate production areas to discharge materials to mixing tanks by gravity. Placement of the Dracco equipment on the roof permits full utilization of all production space.

The handling flexibility and savings produced at Colgate are typical of Dracco installations throughout the process industries.

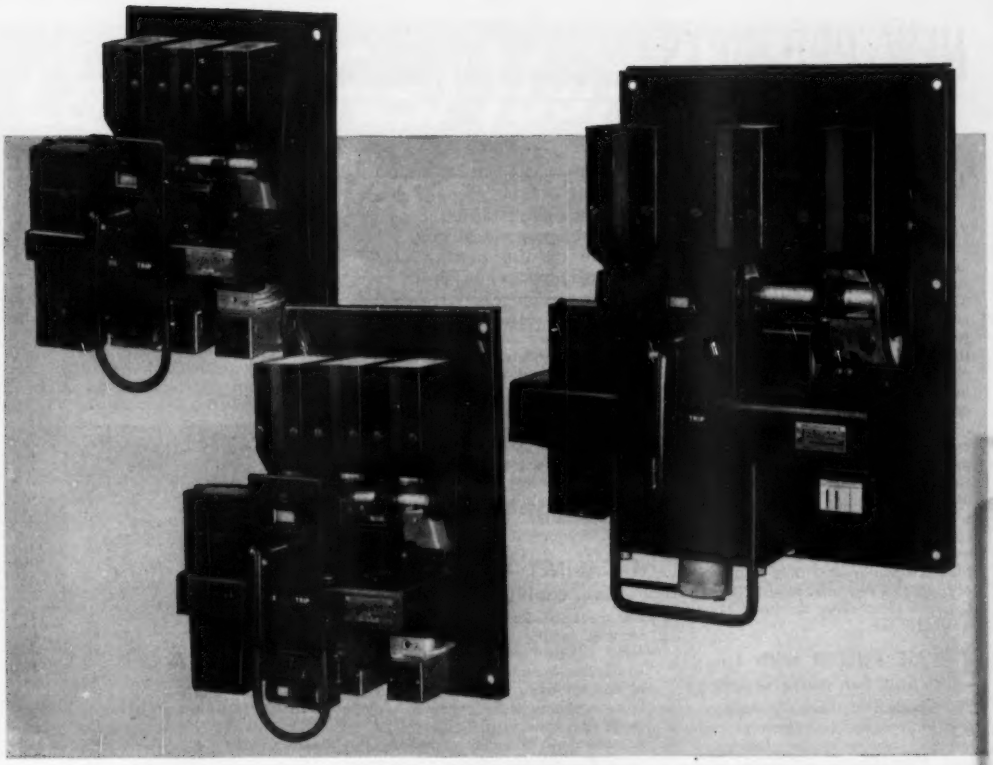
Write Dept. P-10, Cleveland 5, Ohio for the Dracco Airstream Conveyor Bulletin 529.

DRACCO CORPORATION

Harvard Ave. and East 116th St. · Cleveland 5, Ohio

DRACCO *Performance Proved*

Airstream CONVEYORS · DUST CONTROL EQUIPMENT



Here's the most *FLEXIBLE* low-voltage circuit protection available today

Flexible in operation because every Westinghouse DB Circuit Breaker features an adjustable overcurrent tripping device which provides, in a single unit, combinations of delay and instantaneous characteristics for many applications.

Flexible in application because in the complete line of Westinghouse DB Breakers there's a rating for every interrupting duty . . . 15,000, 25,000 and 50,000 amperes. All units are uniform in appearance and performance.

Flexible in design because the breakers in each rating are built with completely interchangeable subassemblies to permit simple addition of auxiliary attachments and to simplify maintenance.

Booklets B-4067 on the DB-15 and DB-25, and B-4740 on the DB-50 contain additional information. For copies, call your Westinghouse representative or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa.

J-60785

YOU CAN BE SURE...IF IT'S
Westinghouse

"DE-ION" CIRCUIT BREAKERS
TYPE DB

NEW PRODUCTS summarized for your convenience

Edited by M. E. Heniken

Further details on any product are available without cost or obligation. List item numbers on the postage-free cards on pages 35-36, 165-166.

1—OVERHEAD CRANES for average industrial use

Just announced is a new line of standardized overhead electric traveling cranes from 1- to 20-ton capacity identified as the Series D Load Lifters. They are intended to provide adequate crane service for average industrial requirements at prices much less than many heavy duty industrial service electric cranes. The new line supplements company's other cranes, but does not replace any already in the line.

Included in the new Series D are construction and design features usually associated with expensive cranes, such as anti-friction bearings throughout, rotating axles on both bridge and trolley, and variable speed magnetic control. The new cranes requiring little overhead space, but giving high hook lifts, are available with a wide variety of speeds and heights of lift. Shaw-Box Crane & Hoist Div., Manning, Maxwell & Moore, Inc.

2—FUSE PULLER with toggle action for more leverage

The Toggle Fuse Puller is designed for double leverage and greater gripping strength, and to enable electricians to pull fuses from tight clips without danger of slipping or twisting. Their design is also said to keep fuses from slipping out of the jaws when being replaced into the panel box. Puller is molded of tough Tenite, is 7½ in. long, weighs 2 oz and fits fuses up to 100 amp. Star Fuse Co., Inc.

3—DIVERTER VALVE for fork truck hydraulic devices

By means of the Diverter Valve, a truck's hydraulic system for tilting the upright can be utilized to operate the special hydraulic attachment, using the standard tilt lever as the means of control. When the valve's plunger is

in the "up" position, oil is diverted to the attachment. When the plunger is in the "down" position, oil flows to the tilt cylinders, and the truck operator has normal control of tilting. Simultaneous operation of the attachment and tilt cylinders is impossible, company points out.

The new valve offers advantages in situations where installation of an auxiliary valve for a hydraulic device would ordinarily be too costly or time consuming, or in the case of old models where major modification would be necessary, making on-the-job installation impossible. Industrial Truck Div., Clark Equipment Co.

4—CABINET UNITS for heating, cooling, ventilating

To meet a demand for economical heating, cooling and ventilating equipment where air conditioners or unit ventilators are not warranted, this line of cabinet units is offered. Combined in a single unit is the ability to provide quick and quiet distribution of heated or cooled air, company states, and inexpensive optional accessory equipment permits the introduction, filtering, heating and distribution of fresh outside air for ventilation.

Cabinet units are offered in models designed for heating with steam or hot water, and cooling with chilled water. To accommodate fresh air introduction, they can be supplied with fresh air plenums equipped with built-in, manually operated mixing dampers, and where desired, air filters. Five enclosure types are available. A catalog giving full data on the units is available. Modine Mfg. Co.

5—BELT DRESSING comes in handy pressurized can

Spragrip is a new belt dressing for increasing the efficiency of flat or V-belt drives, and it comes in a pressurized can for easy application. It is claimed that a squirt of this dressing will prevent slippage of even slack belts, thus lengthening the life of the bearing. A. W. Chesterton Co.

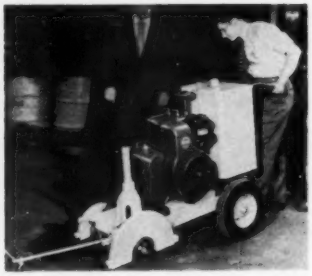
6—HIGH FLOTATION TIRE is designed for use on sand

A new off-the-road tire that provides positive traction in sand or loamy soil is announced. It is the 65 in., 18-ply rating all-nylon wide base Earth-Mover, rounded to produce better flotation. In sand it operates at relatively low air pressures of 20 to 25 lb. Nylon is used in the cord body of the tire because it enables it to withstand flexing better than many cord materials, and tapered bead seats are used to prevent slippage on the rim.

Company engineers point out that in sand and similar materials, aggressive tread designs have a tendency to dig in and become bogged down; shallow type treads such as those of the Earth-Mover do not dig in and the equipment keeps rolling. B. F. Goodrich Co.

7—CONCRETE CUTTER for low cost, fast floor cutting

Using a double-bonded, water-cooled, diamond cutting blade, the Tri-Line Concrete Cutter is designed to produce a fast, smooth-surfaced cut without cracked, spalled or broken edges. Its efficient cutting action opens up concrete and other aggregate flooring for



installation or repair of pipe or electrical conduit or for installation and relocation of machines. The cutter also scores or grooves ramps.

Powered by a 13 hp two-cylinder Wisconsin engine, the cutter permits continuous or intermittent cuts on straight or reasonably curved lines, at any depth to 6½ in. A double-ended arbor allows cutting on either side of the machine. Water is furnished by a 30-gal tank, or machine may be connected to a hydrant. Tri-Line Co.

8—RECORDING POTENTIOMETER has improved chart

Among outstanding features of this null-balancing type recorder is a chart frame which swings out full 180 deg on straight pivots with the chart always remaining in time sequence. When the frame is opened the pen lifts automatically to reduce false line drawing and eliminate pen damage.

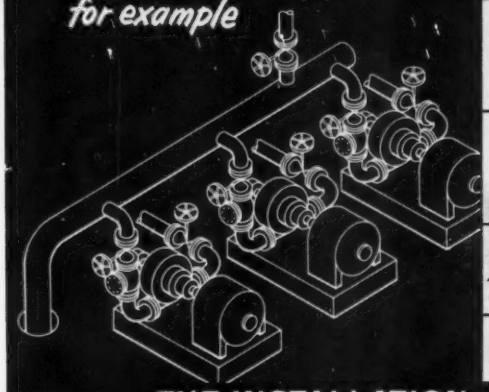
Changing chart speeds and ranges is also simplified. A screwdriver adjustment provides a selection of five different speeds, which are doubled or quadrupled by changing one worm and gear assembly. Changing ranges is done by substituting desired range standard on the range panel.

This recorder also incorporates an improved pen, and the amplifier uses two 12AV7 and two 12AVX tubes that require no matching and are available at radio supply stores. Its case is said to be the smallest of any strip chart recorder of equivalent chart size. Weston Electrical Instrument Corp.

(Continued on page 144)

Can You Trust Your Checks to Hold Like This?

...on Water Pumps, for example



THE INSTALLATION

Crane Iron Body Swing Check Valves in 8-inch vertical lines on discharge side of water pumps supplying a large eastern paper mill.

VALVE SERVICE RATINGS

SUITABILITY: Working smoothly - no complaints

FEATURES: O.K. for either horizontal or upward flow

MAINTENANCE COST: None - no maintenance needed to date

SERVICE LIFE: Now better than other checks used

OPERATING RESULTS: No water or head loss

PRICE: In line with other makes

AVAILABILITY: Stock item - Crane product

THE HISTORY

The mill depends on these pumps for all water. Loss of head at the pumps would create a serious problem. The mill could take no such risks. Regularly, the check valves on pumps were replaced, but only to be found leaking between pumping cycles, a few months later.

It's now more than a year since the change-over was made to Crane Check Valves. There's been no loss of water, no maintenance or replacement of any checks on the pumps. That was proof enough for the mill, that Crane Quality means better valves —greater dependability and bigger value. As a result, 3 more of these checks were installed on a separate battery of suction pumps.

THE VALVE

Crane No. 373, 125-Pound Iron Body Swing Check Valves, brass trimmed. The long life and high seating efficiency of these checks, in 2 to 8-in. sizes, is in large part due to the Crane patented flexible disc-hinge design. Double spring mounting eliminates lost motion between parts, yet permits true, full contact of disc and seat at every closure. Also serves to absorb the shock of seating under back-flow pressure. See your Crane Catalog or Crane Representative for full details.

The Complete Crane Line Meets All Valve Needs. That's Why

More Crane Valves Are Used Than Any Other Make!

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Gear lubricants
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Low-temperature lubricants
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Textile lubricants
Cosmetic oils
Heat-transfer media
Grease components
Leather softeners
Ink and dye diluents
Demulsifiers
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Defoamers
Solvents
Chemical intermediates
Electric motor lubricants

Developed and tested to meet exacting standards in our laboratories, UCON fluids and lubricants are *proved and approved* by engineers and plant superintendents in mills, shops, and factories throughout the country.

UCON man-made fluids and lubricants are completely different from animal, vegetable, and mineral oils—both in chemical nature and in performance. They have all the desirable properties of high-grade lubricating oils, plus remarkable properties of their own.

You can get UCON fluids and lubricants in both *water-soluble* and water-insoluble series—with or without additives. Viscosities range from 50 to between 60,000 and 90,000 SUS at 100°F.

Other Features—

- High viscosity indexes
- Low pour points
- Excellent lubricity
- Non-corrosive to metals
- Non-carbonizing
- Negligible effect on rubber
- Wax-free
- Non-toxic

For an idea of the versatility of UCON fluids and lubricants, look over the list of typical PROVED AND APPROVED uses. Then write for the booklet "UCON Fluids and Lubricants" (F-6500). If you tell us which applications you are particularly interested in, we will be glad to send you specific information.

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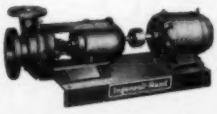
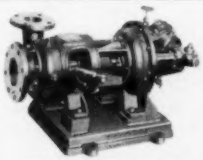
Do you need a SPECIAL PUMP?

No matter how special your requirements, you may get exactly what you want, from ¼ to 50 hp, from this complete line of Ingersoll-Rand Motorpumps:

	HEAVY DUTY	STANDARD DUTY		MODIFICATIONS
MOTORPUMPS	Single Stage 10 to 1800 gpm Heads to 240 ft. Two Stage 20 to 275 gpm Heads to 500 ft.	Single Stage 5 to 250 gpm Heads to 175 ft. Two Stage 5 to 55 gpm Heads to 300 ft. Four Stage 5 to 50 gpm Heads 300 to 650 ft.	Can be supplied with any desired type of direct-connected motor – single or polyphase, a-c or d-c; open, splash-proof, totally enclosed fan cooled, explosion proof or marine type.	Open impellers for handling liquids containing suspended material are available on most sizes of Motorpumps and Cradle-Mounted Pumps. To avoid leakage under unusual conditions, Cameron mechanical shaft seals, smothering type glands, or Merco - Nordstrom grease seals can be supplied. Casings and impellers can be built of special materials where required.
 CRADLE-MOUNTED PUMPS	Single Stage 10 to 2400 gpm Heads to 250 ft. Two Stage 20 to 300 gpm Heads to 500 ft.	Single Stage 5 to 250 gpm Heads to 175 ft. Two Stage 5 to 55 gpm Heads to 300 ft.	Can be supplied with any type of motor (as above)—direct-coupled, gear driven, or V-belt driven. Also available with steam turbine or gasoline engine drive.	
CIRCULATING AND COOLANT PUMPS	Single Stage 5 to 150 gpm Heads to 125 ft.		Available in three types; 1) Immersion type (pump submerged in liquid) 2) External type, with side-wall mounting bracket 3) External type with bracket for horizontal mounting	
 TURBINE-DRIVEN PUMPS	Single Stage 5 to 1800 gpm Heads to 240 ft. Two Stage 5 to 275 gpm Heads to 500 ft. Four Stage 5 to 50 gpm Heads 300 to 650 ft.		Centrifugal pump element same as in Motorpumps – but direct-connected to a velocity stage, impulse type, steam turbine. Particularly applicable to refinery, process and gas plant service.	

These standard I-R Motorpumps are available for prompt delivery—from the factory, or from nearby District Office stocks. Even your so-called "special" requirements can be met quickly from our complete line of standard pump parts. Whatever your pump problem, your nearest I-R representative is qualified to give you expert assistance.

THE CAMERON MOTOR PUMP **Ingersoll-Rand**

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JOHN D. BOEDICKER SUBMITS WINNING IDEA IN CONTROL DERBY

Mr. John D. Boedicker, gas superintendent of New York State Gas and Electric Corporation at Auburn, N. Y., writes us how he has solved the problem of safely operating an unattended gas plant. For his report, Mr. Boedicker won an award in the Honeywell Industrial Control Idea Derby.

At the Clark Street plant in Auburn, a transmission main brings in gas at 40-50 psi. Outgoing mains supply an intermediate pressure belt and a low-pressure local distribution system. The plant's 500,000-cu. ft. water-sealed gas holder is heated in winter by a gas-fired boiler, equipped with Honeywell controls.

During the night, the plant runs unattended. But nobody worries, because Honeywell controls keep watch at all critical points: *Pressuretrol* Units on the high and intermediate pressure gas lines, *Vaporstat* Unit on the low pressure main, and *Pressuretrol* Unit on the boiler.

All these controllers operate signals in a distant substation, where two men are always on duty. Neon lights remain on as long as pressures are normal . . . go out when failure occurs. An alarm bell rings if boiler pressure should fail.

Honeywell *Pressuretrol* Unit

NEW NEWSPAPER HELPS PLANT ENGINEERS

Honeywell's Industrial Division now issues a periodic publication—*Industrial Control News*—which contains detailed information on many new and unusual applications for automatic controls throughout industry. In its pages, production and maintenance men tell how they are reducing costs and increasing operating efficiency on all types of equipment. According to a release from the company, anyone interested in industrial controls can contribute to *Industrial Control News* . . . and can receive copies . . . by sending name, company, title and address to MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, Station 40, 4491 Wayne Ave., Philadelphia 44, Pa.

do you have an "IDEA" for the

Honeywell Industrial Control

IDEA DERBY?

Just send us a sketch and description of how a non-indicating control is now being used to help keep things running smoothly in your plant. Think about it! Then send it in! An impartial board of judges will rate it in terms of its importance to the maintenance of plant operations. You may win a Honeywell Electric Clock Thermostat or one of the other special awards. All material submitted becomes the property of MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, 4491 Wayne Ave., Philadelphia 44, Pa.

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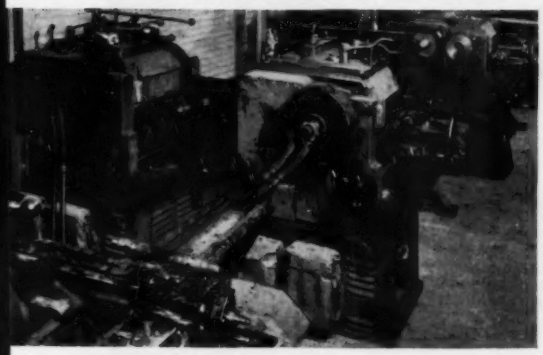
HONEYWELL ELECTRIC CLOCK THERMOSTAT

MINNEAPOLIS
Honeywell
First in Controls

DEFENSE PLANT DE-MOTHBALLED FAST WITH THE HELP OF TWO SUN PRODUCTS



BEFORE: The machinery in this Navy-owned shell-making plant stood idle—coated with a rust preventive—for 5 years after World War II. When asked to reactivate the plant in three months, the U. S. Hoffman Machinery Corporation anticipated a complete machinery teardown for cleaning, because the rust preventive had seeped into the working parts.

AFTER: No teardown was needed. Sun Spirits did the external cleaning job and the detergency of Sunvis H.D. 700 Oils the internal job—cleaning out parts and freeing hydraulic systems. Thanks to the effectiveness of these products, the job was completed and the plant put in operating condition within the three months specified by the Navy.

Recently the U. S. Hoffman Machinery Corporation was asked to reopen a World War II Navy-owned shell-making plant and start production in three months. The machinery, idle for 5 years, had been protected by an external layer of rust preventive. Headstocks, gear units and hydraulic lines were among the parts coated, and unfortunately some of the protective material had seeped into them. It looked as if the machinery might have to be torn down to be cleaned.

Hoffman invited Sun and several other oil companies to survey the machinery and suggest cleaning methods. The company chose Sun's recommendations on the basis of their soundness, as well as on Sun's record for reliable service in other Hoffman plants. The Sun products used eliminated the need for any dismantling. Sun Spirits did the external cleaning job. Sunvis H.D. 700 Oils freed up the hydraulic systems, many of which were extremely sluggish; the detergency of these oils flushed away every last trace of sludge and rust preventive.

Throughout the entire cleaning and recharging process, Sun representatives stayed on the job. As part of Sun's regular service, they trained the oilers, helped work out an inventory control system, and set up lubrication schedules. The terms of the Navy contract were met, and vital defense production was started on schedule. In the year and a half that has since elapsed, there have been no machine failures traceable to poor lubrication.

SUN OIL COMPANY, Dept. PO-10
Philadelphia 3, Pa.

☐ I would like to consult with a Sun representative.

☐ Please send me a copy of "Sunvis H.D. 700 Oils."

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TECHNICAL ASSISTANCE AVAILABLE. Sun's engineers are at your service for consultation on any matters concerning hydraulics, lubrication or metalworking. It will pay you to utilize the broad experience they have gained in solving a wide variety of lubricating and processing problems in many different industries.

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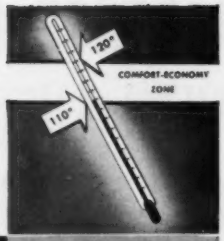
Three of the many reasons why engineers rate Modine the standard of excellence



Discharge air temperatures of 110°-120° F. are correctly related to air velocities — assure perfect heating comfort plus lower fuel costs.

Sturdy, steel, integral fan guard offers safety from exposed fan — serves as a resilient, vibration-absorbing mounting for the unit's motor.

Sound-silencing features assure quieter operation — certified by accurate laboratory sound ratings. Especially important for commercial and institutional use.

Modine steam and hot water units are built in Horizontal (illustrated), Vertical Delivery and Power-Throw models.

YES, by any standard Modine gives you more —

ALL unit heaters are not the same. And it's advanced engineering that makes the difference. Consider performance: Modine balances discharge air temperatures, velocity and volume to give you perfect heating comfort. As for economy — your fuel bills are smaller because Modines deliver heat where and when it's needed. Call your Modine representative today. He's listed in the classified section of your phone book. Or write Modine Mfg. Co., 1563 DeKoven Ave., Racine, Wis.

WHEREVER GAS IS AVAILABLE, MODINE GAS UNIT HEATERS GIVE YOU LOW-COST HEATING!

Modine is the only gas-fired unit heater with both *stainless steel* heat exchanger and burner.

Get a recommendation based on your needs. Write for facts on steam and hot water (Bulletin 149-A) and gas-fired (Bulletin 651) Unit Heaters.

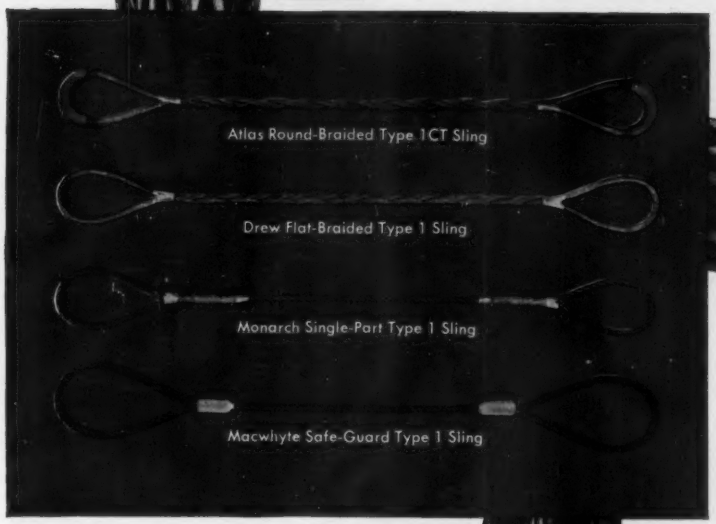
U-1165

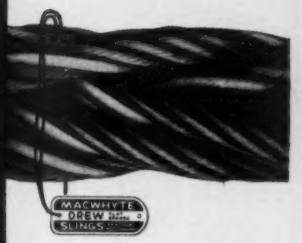
Modine UNIT HEATERS

Send for new sling catalog!

All types...all sizes can be found in Macwhyte's sling catalog... along with detailed information.

Ask for recommendations!


Atlas Round-Braided Type 1CT Sling
Drew Flat-Braided Type 1 Sling
Monarch Single-Part Type 1 Sling
Macwhyte Safe-Guard Type 1 Sling



Macwhyte Slings

Here are four of the hundreds of slings pictured and listed in the newest Macwhyte Sling Catalog. All these slings are made to order in any size with fittings needed for your job. All three types of body are available: round-braided, flat-braided, single-part. Macwhyte has worked with hundreds of sling users toward more efficient materials handling. Our engineers are ready to study your sling needs and make recommendations.

For cranes and hoists specify PREformed Monarch Whyte Strand Crane Rope made by Macwhyte.

Manufacturers of Internally Lubricated PREformed Wire Rope, Braided Wire Rope Slings, Aircraft Cable, Safe-Lock Assemblies, Monel Metal and Stainless Steel Wire Rope.
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Send today for complete sling catalog containing detailed information about slings for every need.

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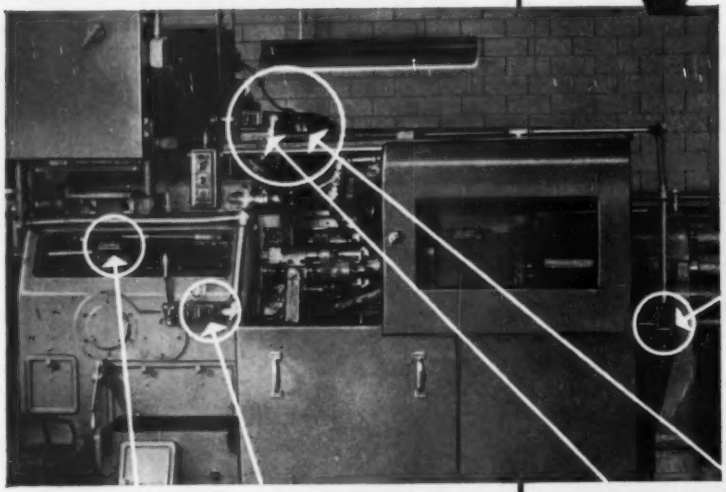
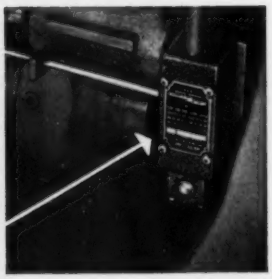
How one plant engineer used 5 MICRO Precision Switches to make a six-spindle screw machine best suited to his production needs!

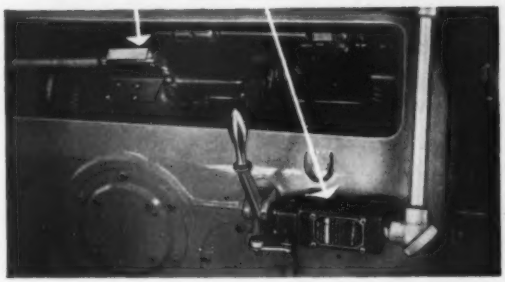
Plant operating men have found hundreds of uses for MICRO precision switches on present plant equipment to make the operation of their machines best fitted to their production needs.

These illustrations show how one plant operating man used five MICRO precision switches to make the operation of a six-spindle screw machine more perfectly adapted to his specific needs.

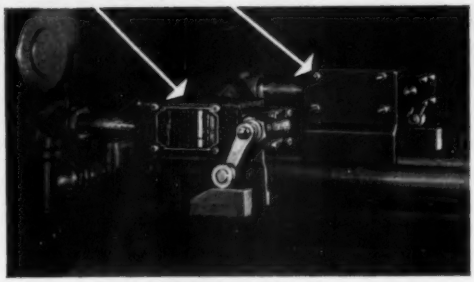




MICRO "5ML1" limit switch (above) that is operated by the chuck closing shoe. This switch must be operated at the same time as the one on the hand closing lever or the machine will stop, thus preventing damage to the shoe and the chuck opening and closing mechanism.



The MICRO general purpose limit switch at upper left has a roller arm actuator. If a part that has been machined becomes jammed in the collet and is not ejected properly, this switch shuts off the motor before damage can occur.
A MICRO "1ML1" limit switch is operated by the hand starting lever as shown at lower right. If the collet is not fully closed, the machine will not start.

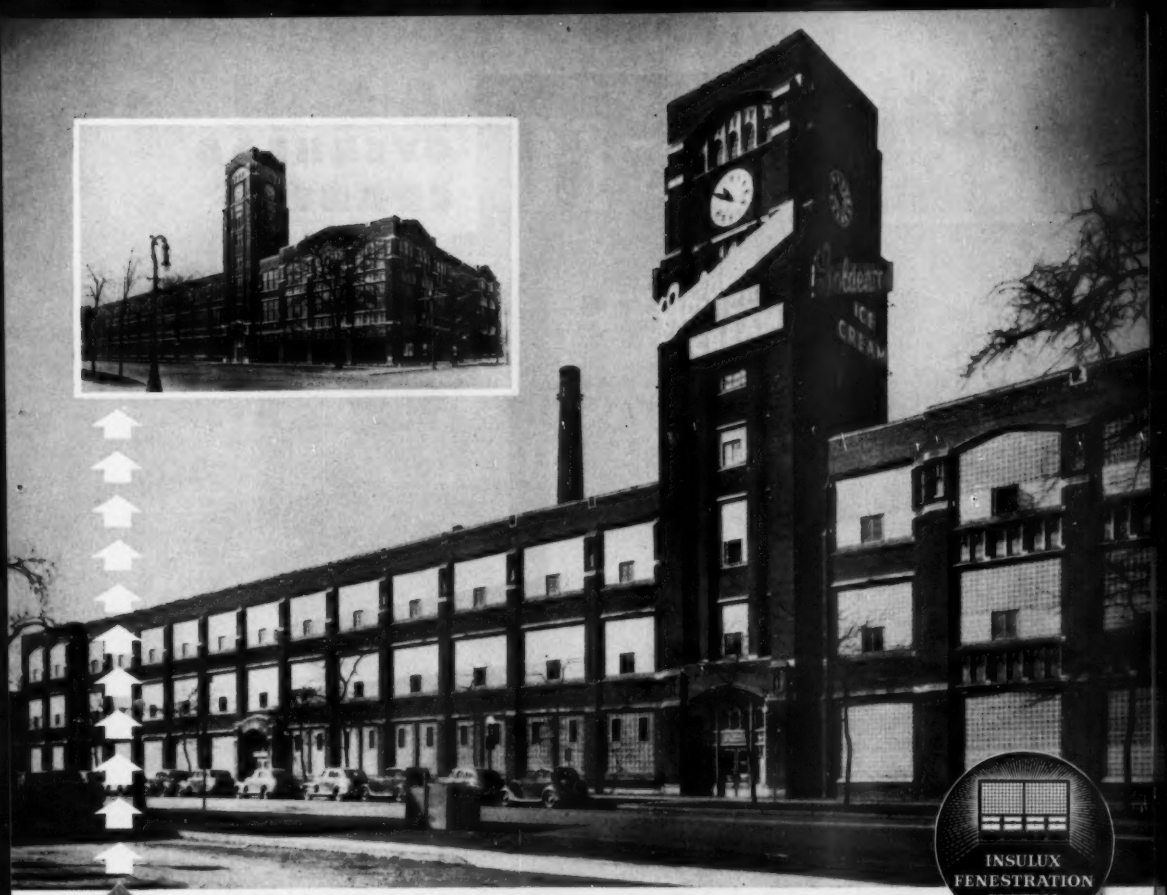


The MICRO "1ML1" heavy duty limit switches shown above operate when the shields on either side of the machine are slid open. This action operates one or the other switch which shuts off the power until the shield is reclosed. This adds to safety of the operator and keeps oil from splashing on the floor.

MICRO distributors are located in over a hundred key cities to supply just the right switch to meet your plant application need. Look for your nearest distributor in your classified telephone book under "Switches, Electric."

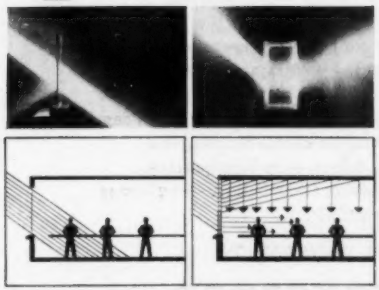
MICRO
MAKERS OF PRECISION SWITCHES
FREEPORT, ILLINOIS

A DIVISION OF
MINNEAPOLIS-HONEYWELL REGULATOR COMPANY



Above photos show plant of Goldenrod Ice Cream Co., Chicago, before and after Insulux Glass Block replaced expensive-to-maintain windows.

Before daylight engineering...NOW! Daylight Engineered



Direct sun causes uncomfortable brightness near windows, extreme contrast in other parts of room. Insulux Fenestration directs and spreads daylight to ceiling, keeps brightness at comfortable levels.

Daylight Engineering can help you plan an Insulux Fenestration System which will more effectively daylight your buildings.

The new Insulux light-directing glass blocks virtually "turn your building with the sun," catching light rays in the morning, at noon, and in the afternoon, directing them to the ceiling. Then they are reflected throughout the inside area.

Insulux Glass Block neither rust, rot nor corrode . . . They have high thermal insulation value . . . seal out dust, dirt and prowlers . . . improve your building's appearance . . . cut maintenance, heat and light costs.

Supplies of Insulux Glass Block and all of the installation materials needed are noncritical and immediately available in quantity.

Before replacing broken windows, rusted or rotted sash, consult a Daylight Engineer about the benefits of an Insulux Fenestration System. For a free consultation, write Insulux Glass Block Div., Kimble Glass Company, Dept. PE-10, Box 1035, Toledo 1, Ohio.

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LO-X Duct's scarf-lap joint slashes installation costs

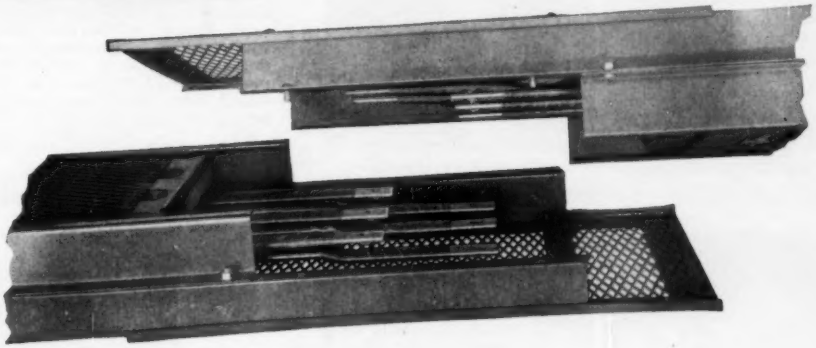
Before you select a bus duct system, be sure to check carefully into installation costs. For it is here, *with BullDog LO-X BUStribution Duct*, that you can make important savings in man-hours, money and materials.

Here's why: BullDog's *exclusive, patented* scarf-lap joint, described below, greatly simplifies installation. Makes LO-X Duct easier, faster to install; gives you a stronger, more rigid system. You save *substantially* on initial installation, and again whenever your plant layout is shifted.

When considered along with other famous BullDog features, low voltage drop and low operating temperature, this reduction means BullDog LO-X Duct will bring you *rock-bottom* current-carrying costs per ampere per foot.

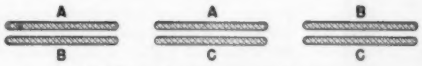
Why not call in a BullDog Field Engineer or your nearby BullDog supplier for *all* the facts? LO-X Duct is used for feeder and welder circuits, carries up to 4000 amperes at 600 volts or less. Ask, too, about BullDog Plug-In Duct for branch circuits. Free literature available by writing direct.

HOW IT WORKS:



SCARF-LAP JOINT—One half of each LO-X casing extends 14" beyond other half; overlaps adjoining casing end to form a highly rigid scarf-lap joint. Casings lap together simply, quickly . . . save countless installation hours. No splice plates, bulky joint covers, or complicated construction to slow down the job and increase costs. No poor bus bar connections, either.

Bus bars overlap also, are bolted with splined steel inserts and special spring cup washers. Joint stays tight, whatever the current or temperature variations.



End view showing staggered-phase arrangement of bus bars in LO-X Duct.

PAIRED PHASING—Another LO-X *plus!* Bus bars are closely spaced inside ventilated casing and arranged in paired phases that neutralize magnetic fields, assure uniform current distribution all along bus bar. Current flows more evenly, voltage drop and temperature rise are reduced.

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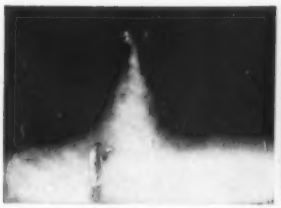
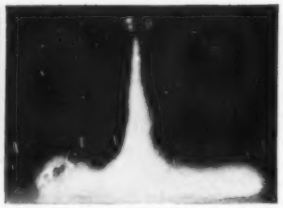
See how TRANE Unit Heaters deliver heat where it's wanted...



Throws heat without diffuser



With louver cone: 60% extra throw

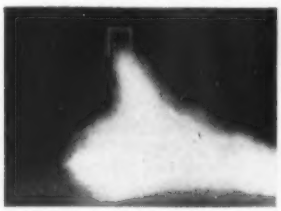
Forces heat to wide area

"Spots" heat to one side

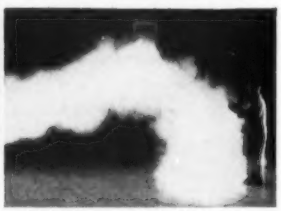
Patented Louver Cone on TRANE Projection Heater concentrates hot air stream for additional throw. Diffuses heat gently, directs it where needed, pinpoints cold spots—all with finger tip control. It taps waste ceiling heat, projects it down to floor line. Ideal for craneways, aisles, bays, and hundreds of other hard-to-heat places.

Diffuses heat in blanket

Split stream does double duty



Up to 25% more throw



Half flow ahead, half at angle

Patented Louver Fin Diffuser gives new versatility to the TRANE Model H horizontal discharge unit heater. Countless diffusion patterns are now available—divided streams, gentle blanket, spot throw. TRANE also makes the Torridor, a blower unit for large volume heating; deluxe cabinet units and new, improved gas fired units. All in a complete range of capacities.

TRANE Bucket and Float Traps—Matched for perfect service with TRANE Unit Heaters; high or low pressure.

For complete information about how TRANE Unit Heaters and Diffusers can solve your heating problems, see your nearest TRANE sales office or write TRANE, La Crosse, Wisconsin.

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Eastern Mfg. Division, Scranton, Pa.
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Offices in 80 U.S. and 14 Canadian Cities

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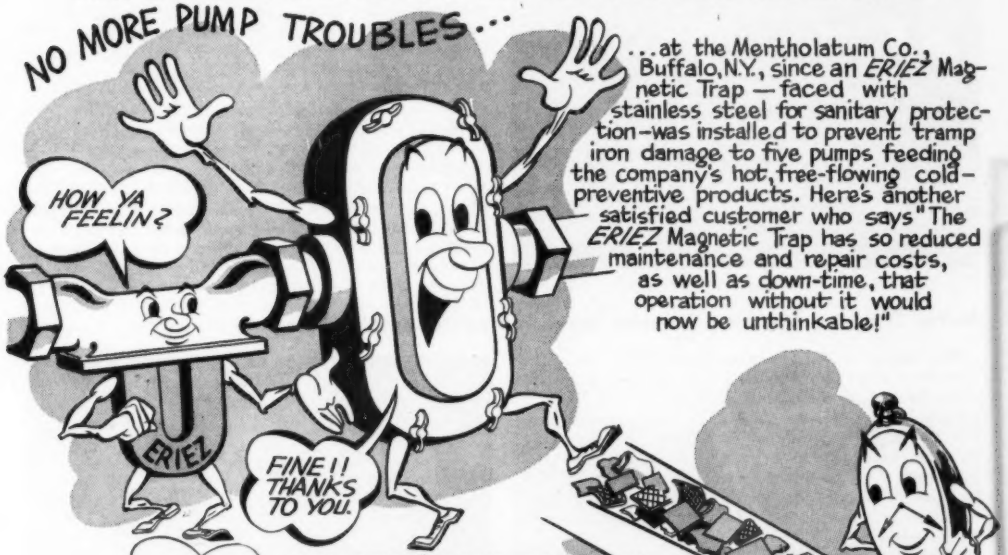
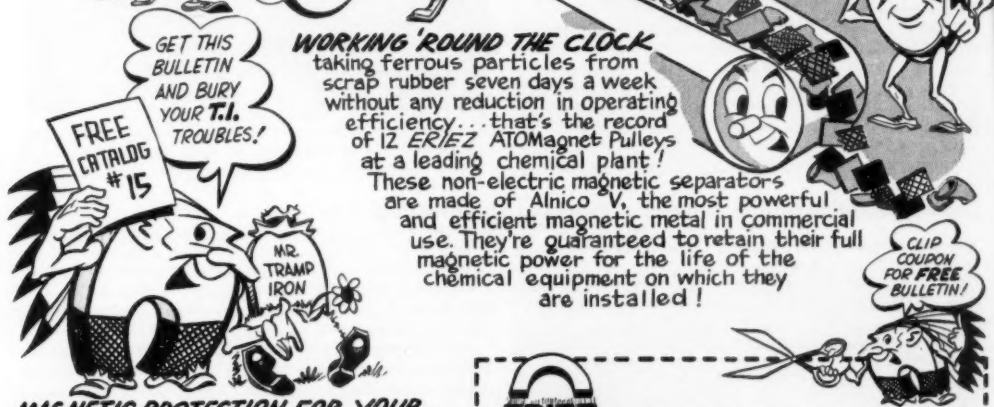
NO MORE PUMP TROUBLES...

...at the Mentholatum Co., Buffalo, N.Y., since an *ERIEZ* Magnetic Trap — faced with stainless steel for sanitary protection — was installed to prevent tramp iron damage to five pumps feeding the company's hot, free-flowing cold-preventive products. Here's another satisfied customer who says "The *ERIEZ* Magnetic Trap has so reduced maintenance and repair costs, as well as down-time, that operation without it would now be unthinkable!"



WORKING 'ROUND THE CLOCK taking ferrous particles from scrap rubber seven days a week without any reduction in operating efficiency... that's the record of 12 *ERIEZ* ATOMagnet Pulleys at a leading chemical plant! These non-electric magnetic separators are made of Alnico V, the most powerful and efficient magnetic metal in commercial use. They're guaranteed to retain their full magnetic power for the life of the chemical equipment on which they are installed!



MAGNETIC PROTECTION FOR YOUR CHEMICAL PROCESSING LINES! A new, big sixteen-page catalog gives complete engineering specifications, drawings, illustrations and descriptions of 25 different types of *ERIEZ* Magnetic Separators for use in the chemical industry. Get your copy today... It's FREE! Use the coupon at right.

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Shop-Built Machine Tests Automobile Radiator Hose

A machine has been built by the Thermoid Co., Trenton, N. J., to test automobile radiator hoses for resistance to flowing liquids. Various conditions of pressure are imposed on the hoses, and during the tests, the machine oscillates to simulate automobile vibration. The machine is sufficiently flexible to test hose of any ordinary length or degree of curvature.

The liquid under test is heated in a tank, and is supplied to the system under pressure. It is pumped from the heating tank to an upper manifold to which 6 outlets, each controlled by a gate valve, are attached. The upper manifold mounting provides vertical, horizontal and angular adjustments, all relative to the lower manifold position.

The lower manifold also has 6 outlets, and is mounted on two revolving discs, drilled to provide increments of eccentric motion to the manifold during a test.

Liquids are constantly recirculated through the system. A hose carries them from the pump to the end of the upper manifold. From the manifold, they pass through the hose or hoses being tested, to the lower manifold and back to the tank where the cycle is being continually repeated.

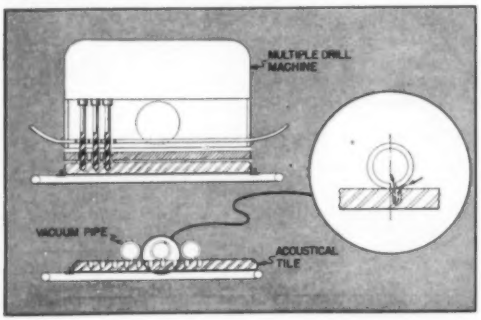
Metal Stitching Machine Reduces Sieve Frame Assembly Time

The frame of a sieve manufactured by the Allis-Chalmers Mfg. Co., consists of 14 lengths of wooden slats. Eleven of these slats require a metal lining to withstand the abrasive action of the material being sifted. Under the original hand assembly operation, each frame required 44 minutes to attach the metal lining strips to the frame boards. A center punch and hammer were used to punch 40 holes through each strip and into each wooden frame piece, and the strips were nailed in place by hand.

A new machine operation uses an Acme-Morrison metal stitching machine, manufactured by the Acme Steel Co. The sheet metal strips are nailed to the board at each end, to position them, and the sub-assembled boards are then run through the stitching machine. Thirty stitches of wire secure the metal strip to the wooden slat, in approximately 1 minute. With this 75 per cent reduction in time achieved, a considerable increase in production capacity was realized.

Conveyorized Vacuum Cleaning Process for Acoustical Tile

A recently developed vacuum system, installed at the Insulite plant of the Minnesota and Ontario Paper Co., efficiently sucks dust from the 484 holes drilled into each piece of the acoustical tileboard.



Formerly, after each tile was drilled, a worker turned it upside down so that the dust left in the holes could be knocked loose. Now, the vacuum system allows the tiles to move unimpeded along the conveyor belt while the dust is removed by suction.

After the holes have been drilled, the tile passes to an endless conveyor belt, running under a set of slotted pipes set at right angles to the conveyor. A 10-in. vacuum, maintained inside the pipes, draws the dust out of the holes up into the pipes. The board is allowed to slide on the pipes, with the suction holding the board against the pipes. The slot in the pipe, about an eighth of an inch wide, allows 99 per cent of the loose fibers to pass through it. The slots are angled so that there is a slight opening, with respect to the tile, toward the departing side of the tile. It was found that if this were not done, and no opening was provided for air intake above the holes, poor cleaning resulted with only the momentary "shots" that the vacuum had at the holes, as each hole approached and left the slots in the pipes.

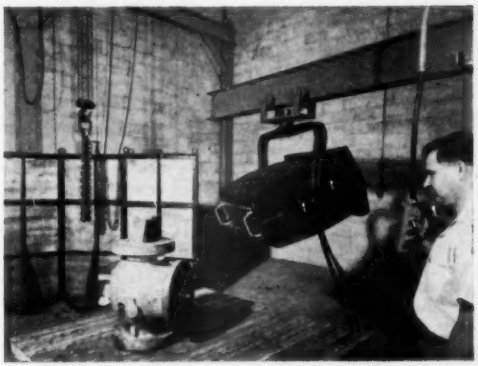
Radiograph Inspection Checks Steel Castings in Quality Control

A technological procedure has just been added by Schutte and Koerting Co., Bucks County, Pa., manufacturers of equipment for power, process and petroleum industries. It is an advanced method of quality control of steel equipment used in high pressure, high temperature applications.

The new technique involves the use of short wave rays to photograph the solid steel casting for the detection of hidden flaws or defects. In this radiographic inspection, the short waves are used to penetrate the objects being inspected, to project a picture of the object's interior to a film.

A 250,000 v x-ray machine is employed to photograph castings up to 3 in. thick. Cobalt 60 rays, produced from a capsule of the radioactive metal, and have power equivalent to slightly over a million volts, are used to penetrate castings up to 7 in. thick.

Although not a new idea, this inspection is of importance because of the nature and end use of the product being tested. Castings have to function under pressures and temperatures so high that pipelines turn a glowing red. Temperatures often approach 1100 F, and the metals become considerably softer than that at normal temperatures. Rigid quality control over metal castings subjected to this service is an invaluable aid to the consumer industries.

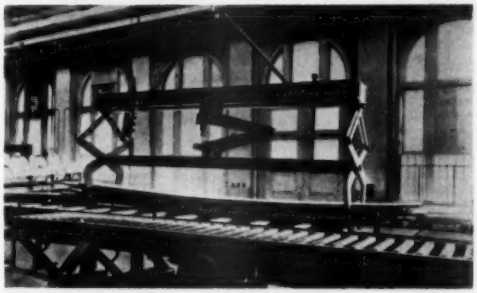


Automatic Tongs Handle Money in Slabs at United States Mint

Slabs of metal, composition 90 per cent silver and 10 per cent copper, in the process of becoming new dimes, are handled by automatic tongs at the U.S. Mint, Denver, Colo. Each slab, 12 ft long, 12 in. wide, and ¾ in. thick, weighs 480 lb, and has a coinage value of $5,000. The tongs, manufactured by the Heppenstall Co., Pittsburgh, Penna., have a capacity of 12 slabs, totalling 5760 lb.

The tong operation is safely controlled by one man, using a pendant type push-button control, suspended near the tongs.

Lowered over the slabs, the tongs grasp them automatically and hold them as they are carried through the area. When the slabs are lowered onto the table conveyor, the tongs open and release the slabs.



Pilot Plant Produces Pure Copper from Scrap Copper and Brass

A vitally important development that may soon find commercial application is a new process for production of pure copper from any form of copper scrap, brass scrap or blister copper. It achieves virtually 100 per cent extraction. The product, better than 99.9 per cent pure, meets all standards for oxygen-free, high conductivity electrolytic copper. The process was developed by the Chemical Construction Corp., in collaboration with the Chemetals Corp.

In the pilot plant at Linden, N. J., the process begins with the lowering of a basket of scrap copper into a leaching solution, where the copper dissolves. From these leaching vessels, the dissolved scrap is pumped to transfer and storage tanks, prior to being pumped into autoclaves. Here, under high temperature and pressure, with reducing agents, the copper is precipitated from solution. The precipitated copper is sent to washing tanks, to wash away the leaching solution, and then to the last step in the process, the rotary dryer.

After drying, pure copper powder is taken from the dryer, ready for processing into industrial shapes.

Giant Spiratube Used to Test Air Conditioners

Extending from the floor to the ceiling of the General Electric Air Conditioning Development Laboratories, a piece of flexible tubing 7 ft in diameter serves as a testing enclosure for air conditioning units. The tubing is 10 ft, 2 in. high when extended. It was fabricated by Flexible Tubing Corp., Guilford, Conn.

Openings cut into the side of the enclosure are used to control the entry of air into the test enclosure, so that temperature and humidity of the entering air can be measured. Remote indicating instruments, located at the test area, indicate the temperature and humidity of the air which is exhausted after passing through the air conditioner. Comparison of these two sets of values gives the engineers a measure of the efficiency of the units being tested.

New Process Coats Ferrous Metals with Aluminum

A new dipping process, Aldip, for coating steel and other ferrous metals with aluminum is being tested by General Motors Research Laboratories.

Importance of the new process is twofold: 1. As a corrosion or rust resistant coating for ferrous metals, Aldip may in some applications replace zinc coated metals; 2. When diffused by heat treatment, it becomes a heat resistant material.

The process is a simple, practical, inexpensive method for producing an aluminum base alloy coating over ferrous metal of high quality. A major advantage is the coating of an entire part or component where a high degree of formability is required.

Aluminum coated fabricated steel manifolds are already in pilot production. Another pilot process is turning out coated heat exchangers at the GM Radiator Div., with the following procedure: Heat exchangers are dipped in an alkaline cleaner, washed in hot water, run through an acid pickle, rinsed in cold and hot water and then dried in a furnace until ready for coating. These steps remove grease, oil, paint, dirt, scale or carbon smear, if cast iron is involved.

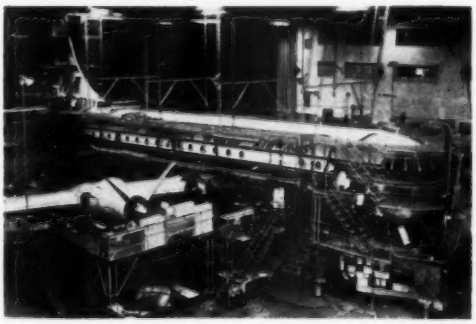
Next, they are dipped approximately 4 minutes in a bath of preheating salt at temperatures ranging from 1280 to 1400 F. Then they are transferred to an aluminum bath which is covered by a layer of salt flux about ½ in. deep. They remain in the aluminum from 30 seconds to one minute.

Thereafter, while still red hot, the heat exchangers are returned to the preheat salt bath and slowly raised. Inside and out they assume a silvery appearance as the skin cools. Airblasting removes excess aluminum.

Giant Drydock Used to Service Commercial Transport Planes

The world's largest airplane service dock is installed at Pan American Airways, Miami, to accommodate the huge double-deck Strato-Clippers.

The "drydock" for the transports is an intricate scaffold-like framework of welded steel tubing and trusses, weighing 75 tons. Fabricated in 5 major sections, the movable dock is rolled into position after the plane is towed into the hangar. The under-wing ramps, engine stands and lower sections of the tail stand are mounted on retractable wheels. The upper tail stand sections and fuselage catwalks are suspended from a monorail system in the roof girders. The dock features a 9-station intercom for ready contact between all levels of the dock. Integral systems for compressed air and electricity provide outlets for these services throughout the dock.



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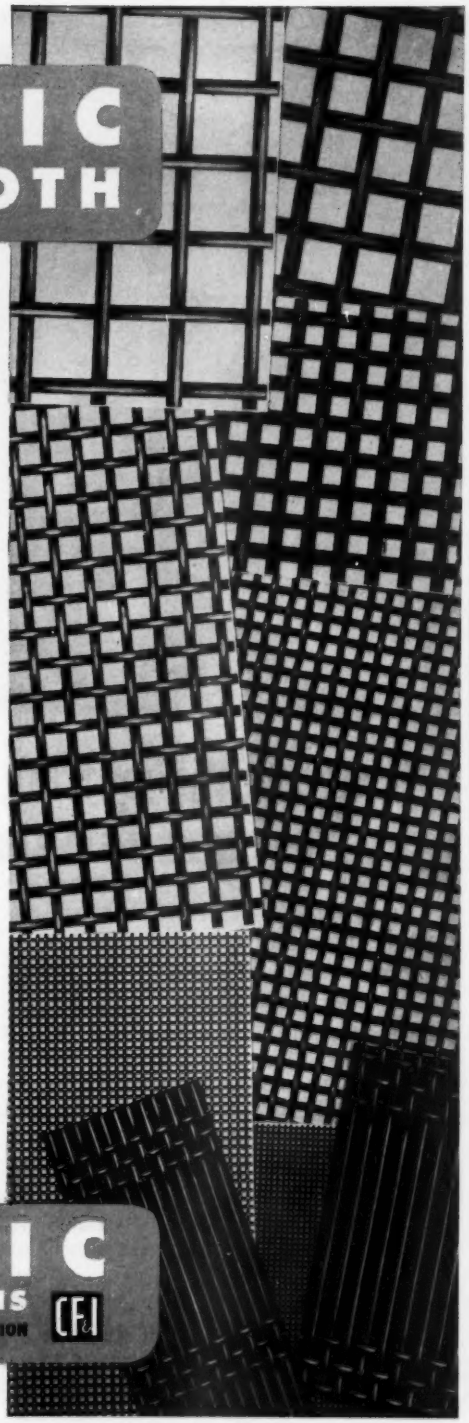

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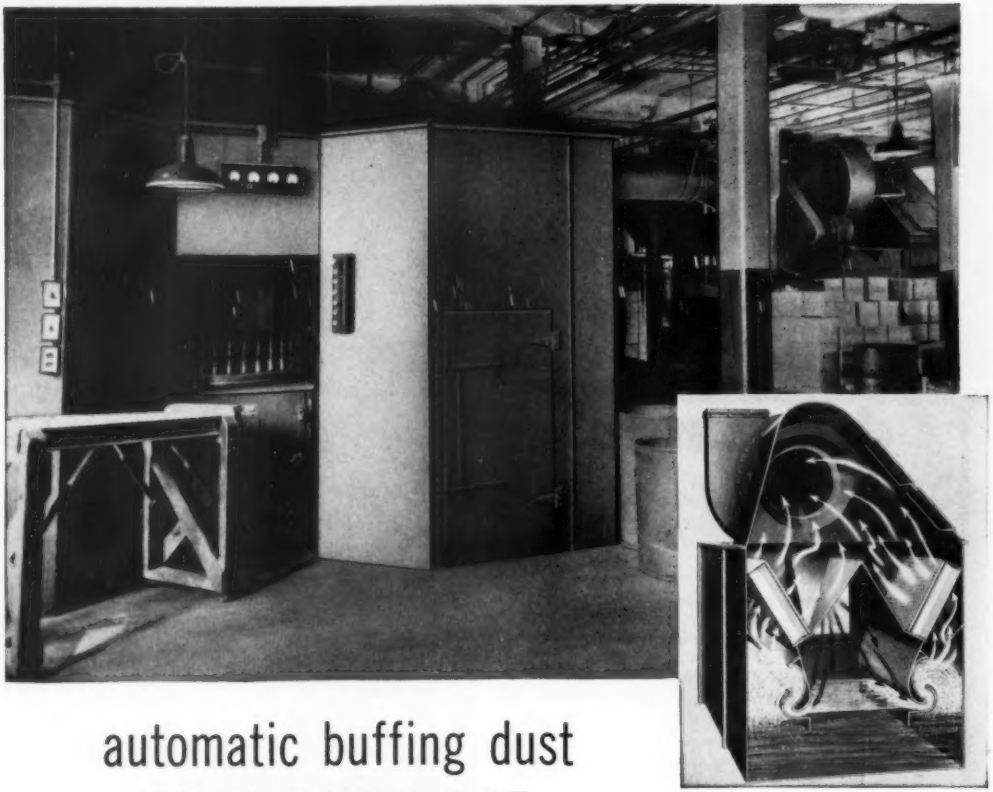
1250

Automatic Buffing Operation Exhausted by Type N ROTO-CLONE Arrangement B.



automatic buffing dust **IS DIFFERENT!**

This Arms Manufacturer Finds Type N ROTO-CLONE Collectors The Practical Answer For Clean Air . . . Better Housekeeping.

Buffing dust has individual characteristics that create a special problem. It is composed mainly of linty particles from buffing wheels which are often impregnated with sticky compounds. Automatic buffing produces this dust in quantities and its sticky nature makes it both difficult to control or to efficiently exhaust by ordinary methods. However, a large arms manufacturer is one of many concerns which has successfully solved this problem with AAF Type N ROTO-CLONES.

The Type N ROTO-CLONE is a Hydro-Static Precipitator providing collection efficiencies of more than 99%. This makes recirculation of cleaned air practical in most cases. In the Type N dust is separated from the air by means of a water curtain created by an induced flow of air through a specially designed impeller. Combined washing and scrubbing action produces high collection efficiencies on all types of dust. Arrangements are available for both manual and automatic removal of sludge.

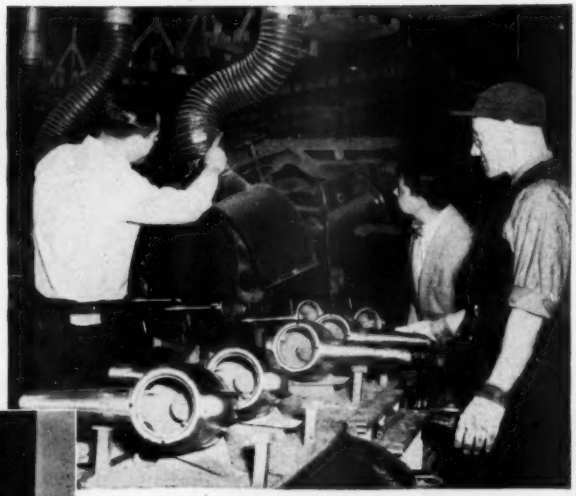
Regardless of your clean air requirements or dust problems look to AAF for practical engineering solutions. AAF representatives are located in all major cities. Write for Bulletin 277.

American Air Filter
COMPANY, INC.
228 Central Avenue, Louisville 8, Kentucky

AAF

American Air Filter of Canada, Ltd., Montreal, P. Q. • Pacific Division Office, San Francisco, California

Whether
DUST REMOVAL
or
MATERIALS HANDLING



You can install SPIRATUBE® yourself

Whether your application requires dust removal . . . or materials handling . . . you can set up your lines of SPIRATUBE to meet your requirements. AND . . . what's more important — you can do it yourself. That cuts downtime to a minimum, and enables you to keep your ducting system in operation to meet your production needs.

SPIRATUBE — the new type flexible tubing — connects quickly, easily to your present lines . . . and bends anywhere with minimum crimping. No turn is too short, no angle too acute. No elbows or special fittings to bother with in going around obstructions!

And — important to you too: The initial cost of SPIRATUBE is small . . . and its life equals — sometimes exceeds — rigid ducts.

Standard sizes for all requirements are immediately available from well-stocked distributors — coast-to-coast.

FOR ALL DUCTING SYSTEMS: **FLEXFLYTE®** **SPIRATUBE®** **AYRTUBE®**

Flexible Tubing
CORPORATION

Guilford, Connecticut **Pasadena 1, California**

FREE! Full details on this amazing, cost-saving ducting. Fill in coupon and mail

FLEXIBLE TUBING CORPORATION **Dept. PE-2, Guilford, Conn.**

Please send me your new catalog on Flexible Tubing products.

My application is_____

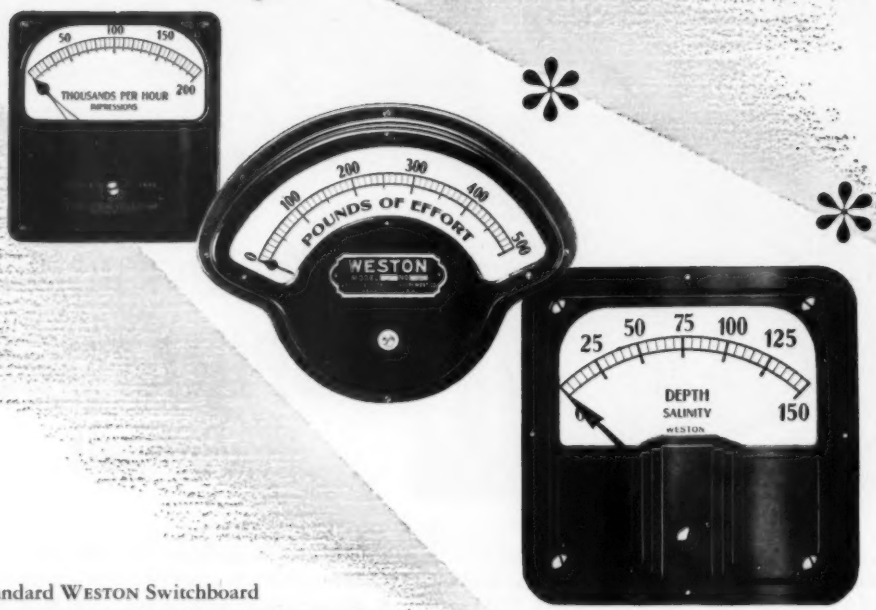
Name_____ **Title**_____

Company_____

Address_____

City_____ **State**_____

*NOT Catalogued!



Standard WESTON Switchboard Instruments are all catalogued, of course. But these are *special* switchboard instruments . . . a few of the many hundreds of different types being constantly engineered and produced to meet specific requirements. Requirements such as . . . *special sensitivities —scale markings—pointer styles and response—mirror scales—adjustment to give maximum accuracy at critical points, etc.* Whatever your instrument requirement . . . *standard or special* . . . the answer is available here at *instrument headquarters.* WESTON Electrical Instrument Corporation, 617 Frelinghuysen Avenue, Newark 5, New Jersey . . . manufacturers of Weston and TAG instruments.

WESTON
798

SWITCHBOARD *Instruments*

You can't stop a bullet with a catcher's mitt

You can't stop corrosion with ordinary paints...

it takes BITUMASTIC COATINGS!

CORROSION can't be stopped by ordinary paints or conventional protective coatings. They can't protect surfaces against the ravages of rust for any appreciable length of time.

But Bitumastic Coatings can!

BECAUSE the six Bitumastic® Protective Coatings, unlike maintenance paints, are specially formulated from a coal-tar pitch base* that is, for all practical purposes, impervious to water. And when you keep moisture away from an exposed surface, you *stop* corrosion.

BECAUSE Bitumastic Coatings provide an extra-tough, extra-thick barrier against corrosive elements—a barrier that is impenetrable.

BECAUSE Bitumastic Coatings provide up to 8 times the film thickness of conventional paint coatings.

BECAUSE Bitumastic Coatings stop corrosion caused by moisture—acid fumes—alkaline fumes—corrosive soil—salt air—heat.

There are 6 Koppers Coatings—formulated to control corrosion of metal and deterioration of concrete. Use the coupon for full information.

**Hi-Heat Gray contains heat-resistant metallic base.*

SEND FOR SET OF FREE BOOKLETS!

Koppers Company, Inc.
Tar Products Division
Dept. 1023T, Pittsburgh 19, Pa.

Please send me, without charge or obligation, your booklets on corrosion prevention.

Name.....

Address.....

City.....Zone.....State.....

KOPPERS BITUMASTIC PROTECTIVE COATINGS

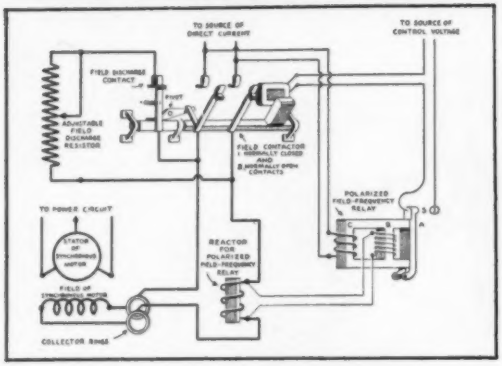
SOLD THROUGH INDUSTRIAL DISTRIBUTORS

KOPPERS COMPANY, INC., Tar Products Division, Dept. 1023T, Pittsburgh 19, Pa.

DISTRICT OFFICES: BOSTON, CHICAGO, LOS ANGELES, NEW YORK, PITTSBURGH, AND WOODWARD, ALA.

EC&M SYNCHRONOUS STARTERS

with Automatic Field Application by Polarized Field-Frequency Relay



Push Button Start **brings motor up to speed automatically. Motor pulls into step *without delay*. Automatic Field Removal if motor slows down on voltage dips or overload. Field automatically re-applied when load re-accelerates.**

★★★

With greater skill than human hands could do it, EC&M Push Button Magnetic Starters provide completely automatic operation of synchronous motors.

At about 95% synchronous speed, the motor is pulled into synchronism. Full Field excitation occurs when the rotor and stator poles are most favorable to locking into synchronism. This causes synchronization to occur without pole slippage, with minimum line current and greatest synchronizing torque.

EC&M Synchronous Starters are built for both low and high voltages up to 4600 volts. They are of unit construction with all internal wiring complete. The cubicle types are totally enclosed and do not require an expensive control room. They may be mounted alongside the motors they control.

Write for No. 21 ACCELERATOR and Bulletins 1075, 1076, 1077 and 1078

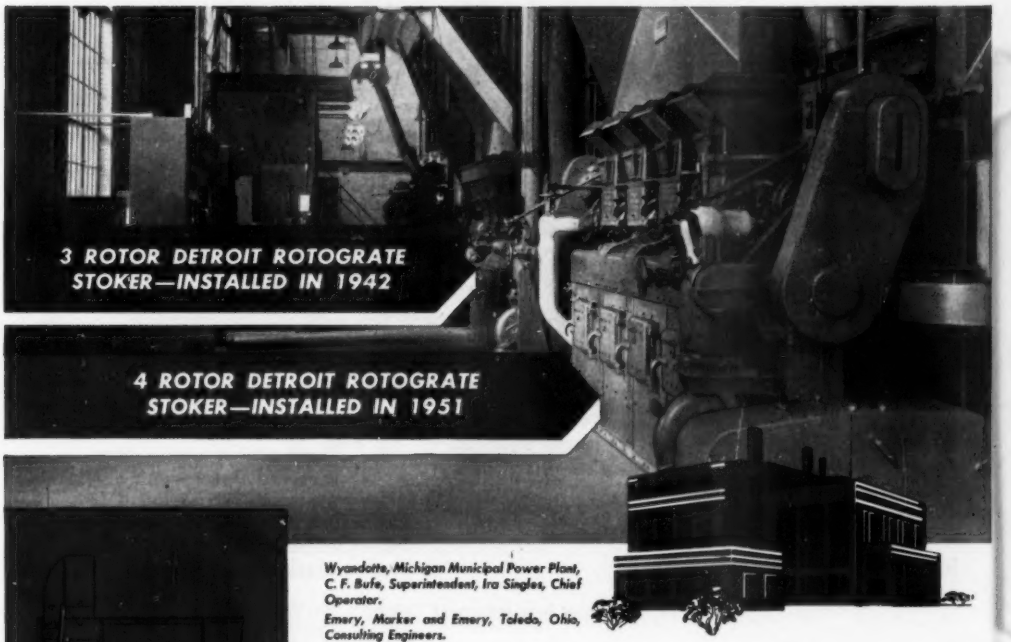
440 Volt EC&M Enclosed Synchronous Starter

2300 Volt EC&M VALIMITOR Starter for Steel Mill Air Compressor

THE ELECTRIC CONTROLLER & MFG. CO.

2698 EAST 79TH STREET • CLEVELAND 4, OHIO

Detroit RotoGrate Stoker's ability to burn wartime coal Brought Repeat Order—Municipal Plant, Wyandotte, Michigan



Wyandotte, Michigan Municipal Power Plant, C. F. Bufe, Superintendent, Ira Singles, Chief Operator.
Emery, Marker and Emery, Toledo, Ohio, Consulting Engineers.

In 1942, the Municipal Plant, Wyandotte, Michigan had coal trouble, as did most plants with old type firing equipment. It became almost impossible to operate on the coal they could get.

They purchased a Detroit RotoGrate, which solved their fuel problem immediately. The RotoGrate proved able to burn efficiently any coal available including the poor stuff which war conditions often forced them to use. In the fall of 1951 when they expanded the plant the Detroit RotoGrate was again the stoker chosen.

Detroit RotoGrate is a modern type spreader stoker with grates that move slowly forward, discharging ash at the front. A RotoGrate installation makes it possible to buy the most economical coal, and burn it with highest economy.

Write for Bulletin.

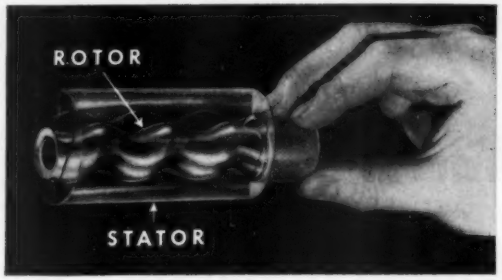
DETROIT STOKER COMPANY

General Motors Bldg. • Detroit 2, Michigan

WORKS AT MONROE, MICH. • District Offices in Principal Cities

HOW IT WORKS

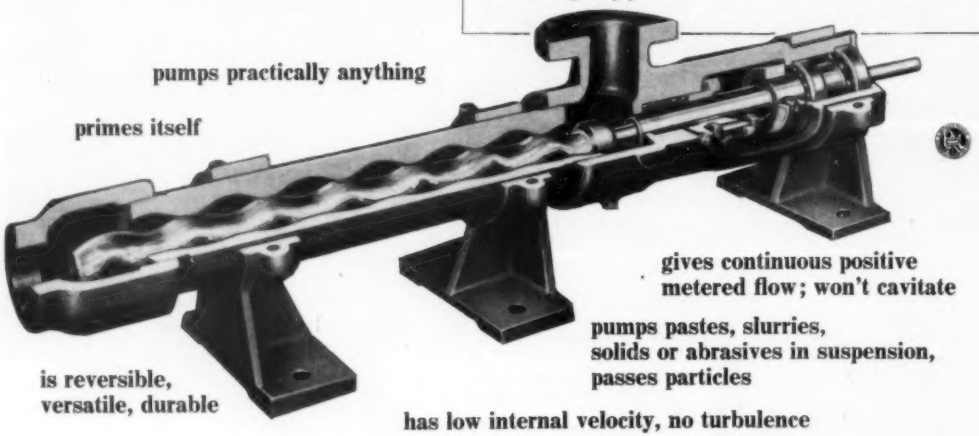
shows why the MOYNO has all these Advantages:



Rotor and Stator Form the Progressing Cavities

Rotor might be described as a stretched-out corkscrew. The stator is like it but has a *double* internal thread. As shown in the illustration, the rotor and stator thus form closely fitted cavities. As the rotor revolves, the material constantly moves or progresses within these cavities toward the discharge end.

Thus material is moved quietly and steadily, with a minimum of turbulence. And because of these cavities, the material may be a paste; it may contain solids in suspension; abrasive slurries are no problem. That is why Moyno pumps can move practically anything that will pass through a pipe.



pumps practically anything

primes itself

gives continuous positive metered flow; won't cavitate

pumps pastes, slurries, solids or abrasives in suspension, passes particles

is reversible, versatile, durable

has low internal velocity, no turbulence

Moynos solve many pumping problems. They will handle acids and alkalis, hot or cold materials, liquefied gases. They'll handle practically anything you can think of as pumpable, and handle difficult jobs better than any pump we know.

Moynos are available in a wide variety of types and sizes and materials, with displacements up to 250 gallons per minute, pressures up to 1000 p.s.i. And you'll be amazed at their small sizes, their high efficiency, their long, trouble-free operation.

Get this free bulletin No. P30BP.

Details, specifications, and a more complete explanation of how Moyno pumps work and what they can handle. Call the nearest R&M Moyno man, or write Robbins & Myers for a copy.

R&M MOYNO® PROGRESSING CAVITY PUMP

ROBBINS & MYERS, INC.

SPRINGFIELD 99, OHIO • BRANTFORD, ONTARIO

DEPENDABLE!

DODGE SC
BALL BEARING
PILLOW BLOCK

EVEN AT LOW SPEEDS
THIS SEAL *PERFORMS!*

It's the famous Dodge metallic-backed neoprene seal that has proved itself in thousands of installations. It stays put. It can't blow. It keeps lubricant in—dust and dirt out—even at low speeds.

The SC Ball Bearing Pillow Block for small shafts and moderate loads, is a precision-built unit—a member of the famous Dodge 30,000-hour line. Modern styling . . . rugged one-piece semi-steel housing . . . long inner race . . . radial and thrust load capacity . . . fully self-aligning. Available from distributors' stocks in shaft sizes from ¾" to 2 7/16". Write for special bulletin giving complete specifications.

DODGE MANUFACTURING CORPORATION
2700 UNION STREET, MISHAWAKA, INDIANA

DODGE
of Mishawaka, Ind.

CALL THE TRANSMISSIONEER, your local Dodge Distributor. Factory trained by Dodge, he can give you valuable assistance on new cost-saving methods. Look for his name under "Power Transmission Equipment" in your classified phone book.

SEALED-LIFE V-BELTS AND TAPER-LOCK SHEAVES

DODGE-TIMKEN PILLOW BLOCKS

ROLLING GRIP AND DIAMOND D FRICTION CLUTCHES

NAME PLATES

FOR YOUR NAME PLATE REQUIREMENTS, WRITE OUR SUBSIDIARY, CHICAGO THRIFT-ETCHING CORPORATION, 1555 SHEFFIELD AVENUE, CHICAGO 22, ILLINOIS

how to pack against acid

Chesterton Blu-Lon is chemically resistant to ALL acids, alkalies and caustics. Its versatility in chemical service is unparalleled. The special Chesterton Suspensoid process individually seals each strand of African Blue Asbestos with chemically inert DuPont Teflon. Blu-Lon will overcome all packing problems on chemical handling equipment. The coupon below will put you in touch with your nearest distributor.

CHESTERTON

'Blu-Lon'

Blu-Lon takes to acids like a duck to water...

Oil seals the duck's feathers; Teflon seals the asbestos strands in Blu-Lon, forming a tough, acid resisting packing.

PACKING Chesterton SERVICE

A. W. CHESTERTON CO., 6 Ashland St., Everett 49, Mass.

Please have nearest distributor give me information on Blu-Lon.

NAME _____ TITLE _____

COMPANY _____ STREET _____

CITY _____ STATE _____

PLE

NEW PRODUCTS

(Begins on page 118)

9—VOLT-AMMETER offers higher voltage ranges

The Type AK-1A is redesigned hook-on volt-ammeter with a new pointer-stop mechanism. It is designed to measure alternating current instantly on five scale ranges: 0-7.5/30/75 /300/750 amp. It can be used on both insulated and non-insulated conductors by hooking it around the power line. It will also measure a-c voltage on three ranges 0-150/300/750 for this the terminals are connected to the line and a positive-action selector switch turned to the desired scale. The pointer-stop mechanism lets the user quickly determine peaks in motor starting currents. Meter and Instrument Dept., General Electric Co.

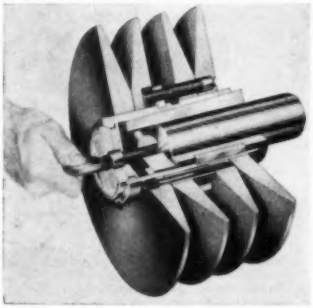
10—RAM ATTACHMENT for electric tiering trucks

Originally designed for the textile industry for handling bolts of cloth, this side-shifting ram may also be used for coils of steel or any material having a center opening. The attachment will move 3 in. either side of the center of the truck's mast. This 6-in. lateral movement, plus raising and lowering the mast is said to permit perfect alignment in placing the ram in the center of the material to be handled.

An optional attachment for company's straddle-type electric tiering truck, the ram is furnished with company's standard tractor. When the mast is raised, the ram has a maximum elevation of 130 in. The Raymond Corp.

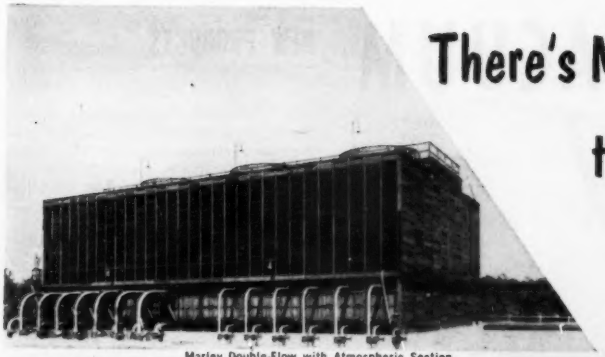
11—VARIABLE SPEED DRIVE for quick speed changes

Engineering features in the four units which comprise this new drive cut down-time on speed changes and increase production, according to manufacturer. Components include a variable pitch motor sheave, a set of wide

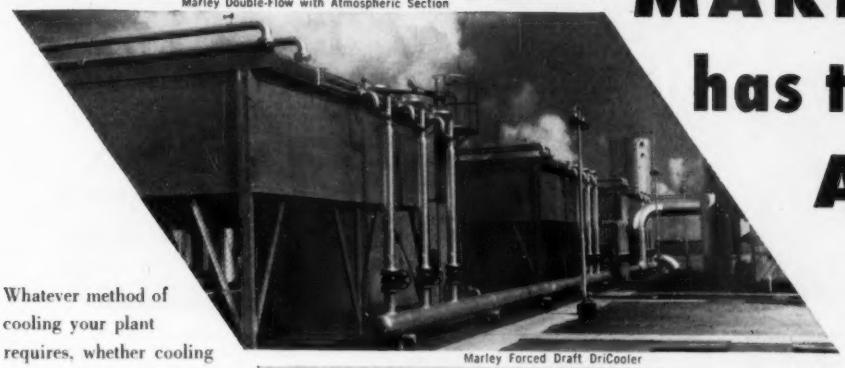


range belts, a companion sheave, and a slide motor base. Company's Taper-Lock principle is used in the bushings for both sheaves in the new drive and contributes to the rapidity and ease

There's More Than One Way to Cool Engines . . . and MARLEY has them ALL!



Marley Double-Flow with Atmospheric Section

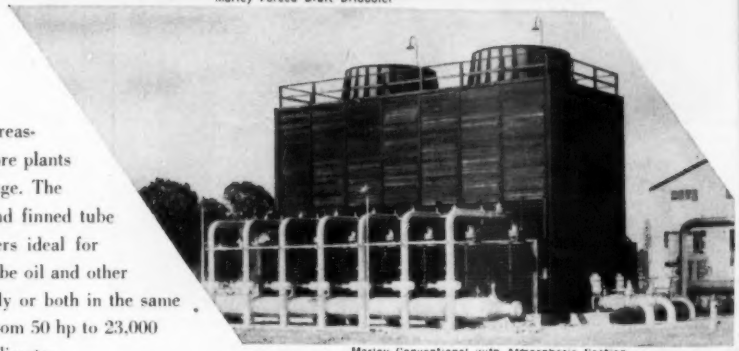


Marley Forced Draft DriCooler

Whatever method of cooling your plant requires, whether cooling medium be air or water, you'll find the finest equipment in the complete Marley line.

Marley Dri-Coolers are increasingly popular as more and more plants utilize air cooled heat exchange. The flexibility of header design and finned tube arrangement makes Dri-Coolers ideal for cooling of jacket water and lube oil and other high level cooling, either singly or both in the same unit. They now serve plants from 50 hp to 23,000 hp, in many countries and climates.

For water cooling, Marley has long set the standard. Marley patented Double-Flow, Conventional induced draft and atmospheric towers are all adaptable for indirect cooling through standard Marley atmospheric sections. Marley towers and sections are completely integrated units and the range of sizes fits every requirement of any size plant.



Marley Conventional with Atmospheric Section

Natural Draft with Atmospheric Section

PRECOOLING AIR is another function of Marley cooling towers. In a single installation 40 Marley Aquatowers are in this type service.

MARLEY

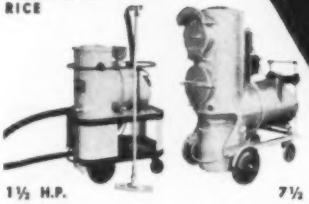
The Marley Company Inc.

Kansas City 5, Missouri

SPENCER VACUUM IN *Food and Chemical* INDUSTRIES

for CONVEYING • INSECT CONTROL • PACKAGING PRODUCTION • RECOVERY SANITATION

RICE



1½ H.P. 7½ H.P.

CHEMICALS

The time required for moving, cleaning, sorting and packaging valuable foods and chemicals has been materially reduced by Spencer Vacuum. Rice and powdered chemicals are handled by the ton. Excess powdered sugar is recovered from chocolate candies, the insect hazard removed at its source and the entire plant made continuously sanitary as an extra dividend, with the same Spencer machine.

Large areas, inaccessible spots in machines and tanks, above pipes and behind radiators are cleaned quickly with powerful vacuum tools. A Spencer size and vacuum tool for every purpose, including offices, boiler rooms and warehouses. Ask for the Bulletins.

427-A

THE SPENCER TURBINE COMPANY • HARTFORD 6, CONNECTICUT

SPENCER HARTFORD

NEW PRODUCTS

(Begins on page 118)

with which speed changes are made. The drive is compact; the sheaves occupy a minimum space on the shaft. The variable sheave assembly locks on the motor shaft as a unit with the turn of a screw. Dodge Mfg. Corp.

12—UNIT HUMIDIFIER for automatic humidity control

The Type E Unit Humidifier is designed for use in all types of industrial spaces requiring automatically controlled humidification as a complete system, for spot humidification, for boosting the

capacity of existing system.

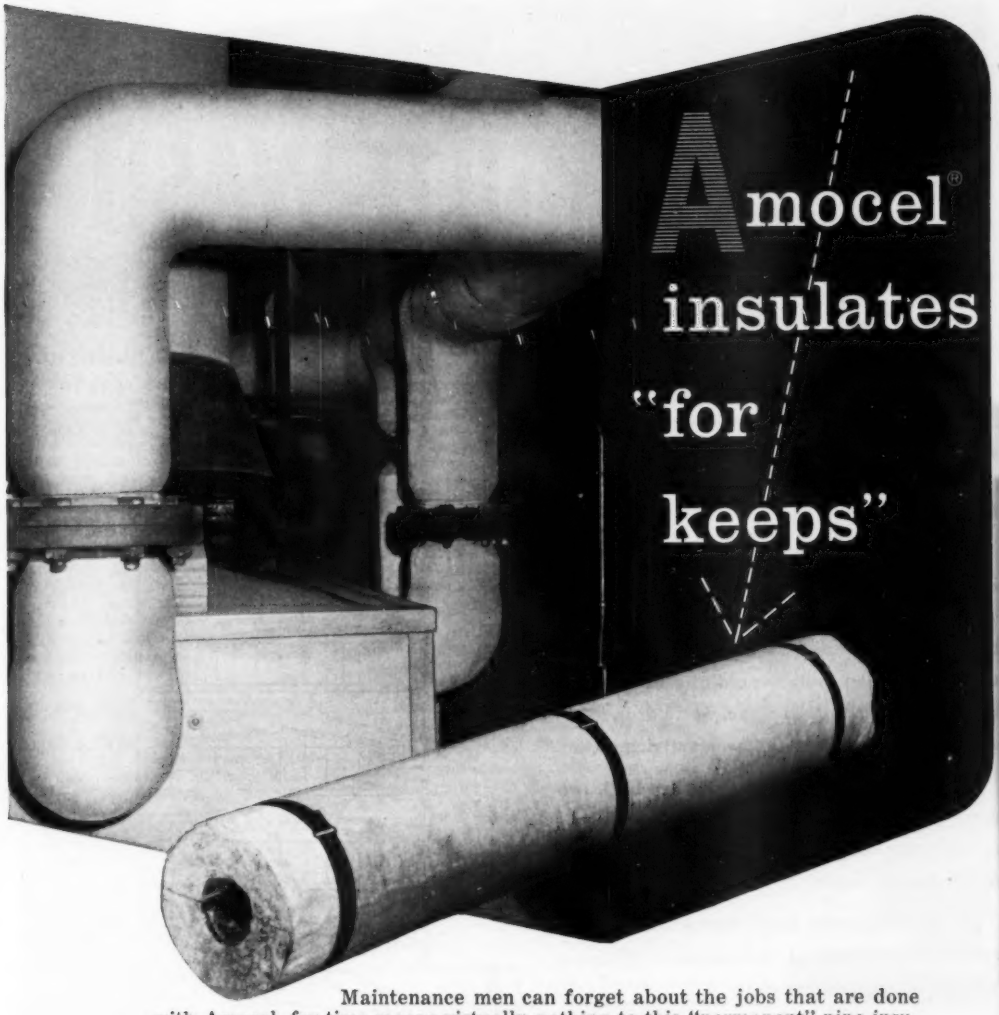
The self-contained metal units are installed by suspending from ceiling, then connecting water supply and electricity. Water is atomized by centrifugal force and distributed horizontally through a 360 deg opening and any portion of the discharge opening may be blocked off for directional distribution. Units evaporate up to 3 gal per hr and may be installed singly or in groups. Units are 15½ in. high, 18¼ in. dia, weigh 55 lb. The Bahnson Co.

13—HEXANGLE TEMPLATE for use in technical drawings

A real time-saver in drawing hex-nuts and hex-head screws in various elevations, the No. 121 Template has 103 cut-outs covering six screw sizes from No. 10 to ½ in. and six elevations up to 90 deg. Cut-outs are arranged so that not only the hexagon shapes but the chamfer circles and flats of the nuts can be drawn. Manufacturer says detail draftsmen will find that the 90 deg elevation and 0 deg elevation provide a quick means of drawing hex-nuts and hex-heads in layout and assembly drawings. The Template is made of plastic, is 7½ by 5¾ in., costs $4.00. RapiDesign, Inc.

14—COLD-SET COATING is cured by catalyst

Ricwilite 7100 is a cold-setting phenolic resin coating which is cured or polymerized at room temperatures by the addition of a catalyst just prior to application. Manufacturer says it can be applied to almost all metals, concrete,



Maintenance men can forget about the jobs that are done with Amocel, for time means virtually nothing to this "permanent" pipe insulation. It's Unarco's exclusive development for low-cost commercial use on steam and hot water lines and for all other work within 600°F., maximum. Amocel has many of the fine extra-service features formerly found only in Unarco's higher-temperature insulation, Unibestos. You'll like its easy application; its money-saving, long-lived efficiency.

UNARCO

Write for Bulletin No. 76-109, and the name of the Unarco Warehousing Distributor in Your Area

UNION ASBESTOS & RUBBER COMPANY

Dept. J-10, 332 SOUTH MICHIGAN AVENUE • CHICAGO 4, ILLINOIS

IT'S *Actually* THE MULTIPLE WASHING ACTION

THAT MAKES THE **MULTI-WASH** *so efficient!*

The Schneible patented Vari-vane construction gives the *extra* washing action that makes Multi-Wash dust control systems outstanding in efficiency and low cost operation.

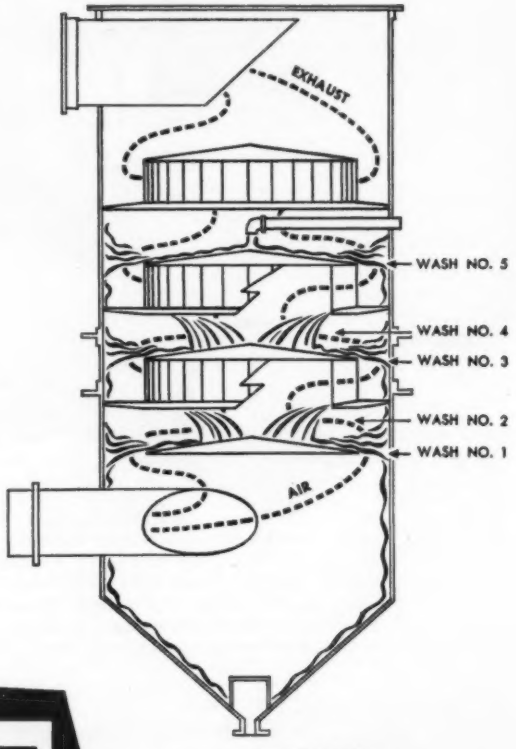
The cutaway diagram shows a type JC—2½ stage collector. Each impingement stage provides two washes of incoming dust-laden air, plus one at the bottom deflector plate, or five separate washes. This thorough scrubbing removes ordinary dust particles down to the two micron range, which drop to the sludge cone and then go to the dewatering tank.

For each impingement stage that is added, two extra washes are provided, increasing the efficiency and allowing the collection of finer particles down to sub-micron ranges.

It's easy to see why Multi-Wash is preferred by manufacturers who insist on the utmost in efficiency with lowest maintenance cost!

Your local Schneible representative can help you provide better dust control, or write direct for complete information.

Cross-section diagram of type JC Multi-Wash collector showing 5 points of washing action. The type IC with 4½ impingement stages provides 9 washes while the HC with 6½ stages gives a total of 13 washes for removal of extremely fine particles.



SCHNEIBLE

PRODUCTS:

Multi-Wash Collectors • Uni-Flo Standard Hoods • Uni-Flo Compensating Hoods • Uni-Flo Fractionating Hoods • Water Curtain Cupola Collectors • Ductwork • Velocitrap • Dust Separators • Entrainment Separators • Settling and Dewatering Tanks • "Wear Proof" Centrifugal Slurry Pumps

CLAUDE B. SCHNEIBLE COMPANY • P. O. BOX 81, NORTH END STATION • DETROIT 2, MICHIGAN

NEW PRODUCTS

(Begins on page 118)

wood and plaster surfaces by brush or spray. It is tack-free in 3 or 4 hr, cured in 7 days.

Ricwilite 7100 is suggested for use in corrosive conditions or on specialized equipment where the use of a baked-on coating is impractical. It is said to possess exceptional resistance to strong acids, alkalies and solvents. With this coating it is possible to obtain greater film thicknesses in a single application than that obtained with many high corrosion resistant coatings. Ric-wiL Plastic Coating & Mfg. Corp.

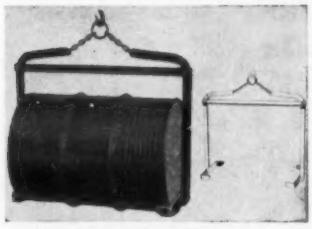
15—HYDRAULIC PULLER UNIT includes pump and ram

A new streamlined hydraulic pump and a 50-ton portable Power-Twin Ram are newest additions to this company's hydraulic pulling equipment. The pump has several features designed to make it more efficient, faster and easier to use. A new gage, calibrated for 50 tons and under to provide exact pressure when installing bearings is available.

The new 50-ton ram is the latest and largest of company's hydraulic rams with center hole for fast adjustment to work and the use of company's standard attachments and pullers. All three rams operate off the same pump. Owatonna Tool Co.

16—TOGGLE-TYPE CRADLE for all shapes of barrels

Besides being suitable for picking up practically any shape of barrel, plywood or fiber drums, including those



with straight or bilged sides, flat or chimed ends, this cradle is also suggested for handling rolls of paper, carpeting or anything cylindrical. Of welded heavy bar stock, a 1000-lb capacity model accommodates barrels of 20 to 25 in. dia, 32 to 36 in. length. It weighs 45 lb. Special sizes can be built to suit individual plant requirements. The Palmer-Shile Co.

17—PNEUMATIC MECHANISM for power circuit breakers

More powerful than a solenoid mechanism, this pneumatic device is said to provide the increased energy required in the quick closing and reclosing of circuit breakers of high interrupting capacity. Two sizes are available: the

SAVE

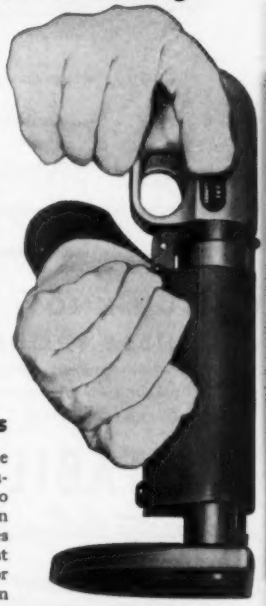
MORE THAN EVER . . . NEW

Ramset FASTENING SYSTEM JOBMASTER

and *Tru-Set Fasteners*

for steel and concrete fastening

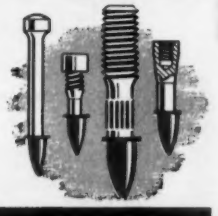
★ star values bring new ease, speed, utility and economy



SEE the new RAMSET JOBMASTER that fastens **in split seconds** into steel or concrete. Check the big, **10-Star Values** for faster, easier, better fastening than ever before. **One-Piece Tool** and **Trigger Action** for quick, simple loading and firing. **Self-contained Barrel Extension,** always ready when needed. **Gas Diverter** to stop spalling. **Visi-Chek Button** and **Manual Safety Control** for positive protection. Exclusive **Roto-Set Safety Shield** for pin-point positioning. All these add up to the greatest work-saving, time-saving, money-saving advantages in the industry.

Always Use Tru-Set Fasteners

When you add these JOBMASTER values to the advantages of Tru-Set Fasteners, with the exclusive Red-Tip Pilot that guides them straight to the work, you've got an unbeatable combination for ease, speed, utility and economy. With 54 sizes and types, there's a Tru-Set Fastener for almost any job. Ask your RAMSET Dealer today for Fastener Specification Booklet, and demonstration of how this RAMSET team can cut fastening costs and get work finished faster. Remember, RAMSET SYSTEM is the pioneer in powder-actuated fastenings—with more users than any other tool.



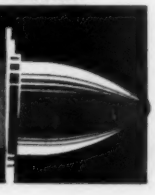
Ramset Fasteners, INC.

Division of Olin Industries, Inc.

12117 BEREA ROAD • CLEVELAND 11, OHIO

DON'T HAND SET...

Ramset WITH TRU-SET FASTENERS



WHAT YOU DON'T KNOW

(About Automatic Voltage Regulation)

CAN HURT YOU !

DO YOU KNOW THAT
Fluctuating Line Voltage
CAN and WILL

- prevent electrically operated machines from operating at full rated capacity
- shorten the useful life of your electrical equipment
- result in unreliable electrical testing
- reduce the efficiency of your lighting systems
- invalidate laboratory experiments and reports
- cause unnecessary electrical maintenance and repair costs

DO YOU KNOW THAT YOU CAN AVOID ALL THESE TROUBLES— and be sure of reliable readings and full-efficiency operation of all your electrical equipment at all times by maintaining a constant output voltage regardless of line or load changes. And there is no better way to accomplish this than with a —

STABILINE
Automatic Voltage Regulator

LEARN THE IMPORTANT FACTS NOW
SEND TODAY FOR YOUR COPY OF BULLETIN S351. JUST FILL IN AND MAIL THE ATTACHED COUPON.

The SUPERIOR ELECTRIC Co., 1210 Thure Ave., Bristol, Conn.
Please send me my free copy of STABILINE Bulletin S351.

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CO. ADDRESS _____
CITY _____ ZONE ____ STATE _____

THE SUPERIOR ELECTRIC CO.
BRISTOL, CONNECTICUT

POWERSTAT LIGHT DIMMING EQUIPMENT • STABILINE AUTOMATIC VOLTAGE REGULATORS • 5-WAY BINDING POSTS
VOLTBOX A-C POWER SUPPLIES • POWERSTAT VARIABLE TRANSFORMERS • VARICELL D-C POWER SUPPLIES

NEW PRODUCTS

(Begins on page 118)

Type AA-7 and the Type AA-10 with 7- and 10-in. pistons, respectively, used for closing breakers ranging from 14.4 kv, 500,000 kva through 230 kv, 15,000,000 kva.

The mechanism is mechanically and electrically trip-free—compressed air cannot hold the breaker closed when the trip coil is energized, company states, and high speed reclosing in 20 cycles, ultra-high speed reclosing in 15 cycles, as well as multiple high-speed reclosing are possible. Westinghouse Electric Corp.

18—GAGING HEAD designed for wide tolerance work

A new type of gaging head, the Plunjet is for use in conjunction with air gages for gaging wide tolerance work, and can be adapted to a wide range of applications. This gaging head is calibrated by a feeler gage having minimum and maximum limit elements.

Two types are available, the normal and the reverse, and they come in three standard ranges: 0.040, 0.020, and 0.010. Plunjets for special ranges and closer tolerances can be supplied.

The Plunjet is announced as having many advantages, especially for measuring irregular parts such as the profile of aircraft turbine blades and buckets. It is said to be particularly useful for measuring flatness; for general machine shop work; in gaging wide tolerances on inside diameters exceeding 3 in. and on lathes and other metal removing equipment to tell when the part is reaching the proper size. The Sheffield Corp.

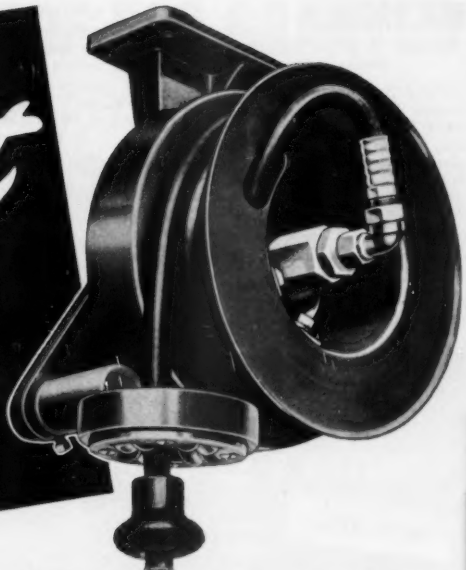
19—TUBULAR HEATER for welding steel pipe, plate

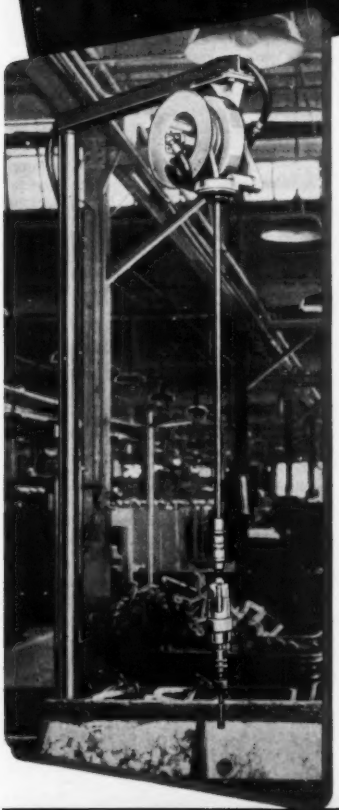
In this electric tubular heater, various designs of company's basic Chromalox unit are used to prevent loss of metal strength. The heaters reduce the temperature differential between the weld area and adjacent metal, company explains, thereby eliminating "locked-in" stresses. By placing the heaters between the weld line and larger sections of cold metal, a "heat dam" is formed which slows conduction of heat away from the weld. In a straight line weld, heaters are held in place about 6 in. from the weld line by bolting them to tack-welded studs.

Heater elements are triangular in cross section, and one flat side is in contact with the work. In operation the

One Unit

COMBINES TOOL SUSPENSION AND AIR SUPPLY





WAYNE "*PRODUCTION-BOOSTER*" HOSE REEL

Get more production per worker . . . save cost of duplicating equipment and maintenance with Wayne Industrial Hose Reels. One unit combines tool suspension and air supply which simplifies installation . . . keeps tools always within reach . . . saves time on high speed production assemblies.

Spring tension of the reel counterbalances weight of air tool. Allows finger tip control of pneumatic drills, screw drivers, nut runners, grinders, blow guns, spray guns and other air activated tools. Powerful spring motor, with permanent lubrication, provides automatic uptake of tool . . . leaves both hands free to remove work from machine.

Cut worker fatigue . . . increase production . . . reduce tool maintenance costs . . . prolong tool life by installing Wayne Industrial Hose Reels on your production and assembly lines. There's a Wayne Reel to meet every requirement whether for air, oil or water.

THE WAYNE PUMP COMPANY
SALISBURY, MARYLAND • TORONTO, CANADA

Wayne

NATION WIDE SERVICE

INDUSTRIAL HOSE REELS

FOR AIR, WATER, FLUID LUBRICANTS AND COOLANTS

NEW PRODUCTS

(Begins on page 118)

heaters are turned on before welding begins until a temperature of 400 to 500 F is attained in the weld zone and they are left on after welding is completed. Results reported for controlled heating and cooling include improved quality of weld; better adhesion of weld deposit. Edwin L. Wiegand Co.

20—PACKAGE BOILERS with air atomizing burner

Refinement of the Voriflow Burner incorporated in the Powermaster Package Boilers to simple yet rugged components is announced. This is an air atomizing burner credited with excellent flame pattern and consistently clean combustion with light through No. 6 Bunker 6 oils over loads from 30 to 100 per cent.

In this burner, the beryllium copper body holds the stainless steel cap over multiple slots in the core to form converging flow paths for the atomizing air. Only about 1 per cent of the total full load combustion air is thus admitted with the oil for atomization, company explains, to permit much closer control of the combustion air from the blower and resultant high efficiency at light loads. Fuel oil flows through the central tube and through individual perforations into the atomizing air streams. Dams near the end of the tube serve to prevent dripping after shut down. Bulletin 1218 describes packaged automatic boilers with this burner. Orr & Sembower, Inc.

21—VOLT-AMMETER, pocket-sized, has nine ranges

Latest of manufacturer's snap-around volt-ammeters, the new Amprobe 300 has nine ranges up to 300 amp and 600 v covering 0-6/15/30/60/150/300 amp a-c, 0-150/300/600 v a-c. Design features announced for the new model include voltage test leads with retractable safety plug which automatically insulates itself when removed from meter; jaws insulated down into the sockets; probe jaws pointed for working in crowded switch and terminal boxes. The Amprobe 300 is priced at $49.50, complete with leather case and voltage test leads. Pyramid Instrument Corp.

22—LIFT TRUCKS designed for easy use, economy

Red Arrow Trucks are described as low priced, yet designed for safety as well as easy rolling, steering and lifting. Among important construction features are the heavy duty compression check used for lowering loads to the floor, machine bolted frame, tapered roller bearings for easy turning, and automatic engagement and disengagement of handle. The handle is free from the lifting mechanism when operator pulls the truck, and automatically connects when returned to vertical position. Models are available in capacities from 2500 to 5000 lb. Lift Trucks Inc.

23—DRAWER UNITS can be assembled to fit plant space

These welded, all-steel drawers when bolted together in scores of combinations, can be tailored to almost any space. They are designed to be used in tiers of two to five or more, in rows, or singly. The units are enclosed and can be assembled to stand on the floor, in cabinets, on bench tops, or hanging from bench tops, or fastened to desks.

They can be re-assembled to meet changing space conditions.

Finished in green, the drawer units come in three standard sizes, the small-

THIS new "big boy" of the Westinghouse "Y" line of Air Compressors is made to order for growing businesses. Equipped with a 15 hp motor and having a displacement rating of 68 cfm, it's big enough to handle that extra equipment you may add next year or the next.

It's built for tomorrow in terms of service life, too. The 15 hp "Y" incorporates all the Westinghouse features that assure long, uninterrupted operation . . . features that include low oil level protection, positive starting unloader, controlled pressure lubrication and thermal overload protection.

For quick, easy changes between continuous and intermittent operation, this Westinghouse "Y" is equipped with dual control. Change-over requires only a turn of the cock handle.

Westinghouse Air Compressors are built to require minimum attention, but when you want service you want it quickly. And you get it quickly from the nearest of 250 distributors and dealers throughout the country.

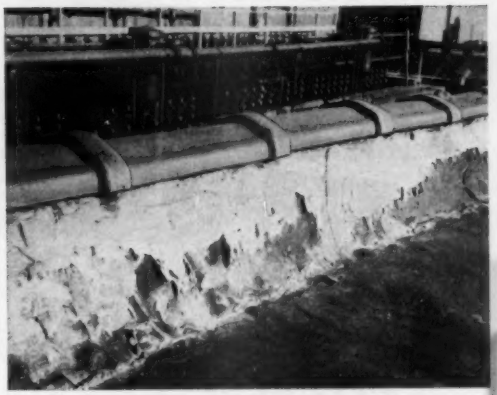
Remember Westinghouse Air Compressors for the best in design—the best in construction—the best in service.

INDUSTRIAL PRODUCTS DIVISION
WESTINGHOUSE
AIR BRAKE COMPANY
WILMERDING, PENNA.

DON'T TAKE YOUR ROOF FOR GRANTED

Get a Built-Up Roof Survey *FREE* of charge!

Rot, which is the result of condensation, may cause extensive damage to an uninsulated roof deck. The proper roof insulation would have prevented the condition shown here.



Improper materials, or inadequate application of the original felts and cementing agent, often cause troublesome leaks. In this case a cloth membrane was used instead of the proper flashing felt.

The *FREE* Roof Survey Report helps you avoid costly roof failures such as those shown above. It tells exactly what condition your roof is in, helps you plan roofing maintenance.

EVEN though your roof doesn't *seem* to be leaking, it may be in need of attention. Many a roof with torn flashings, dried-out felts, even rotted decks has been assumed to be in "good condition."

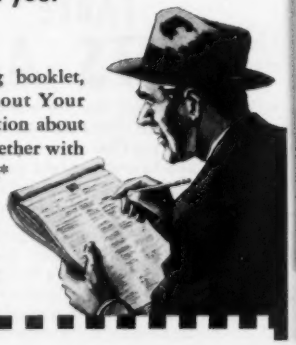
To anticipate costly damage, often hidden, and numerous repair bills, hundreds of plant engineers and maintenance executives have already used the free Johns-Manville Roof Survey Report.

The Roof Survey Report is an accurate picture made by a roofing *expert,* the J-M approved Built-Up Roofing Contractor. It covers all critical areas—flashings, decks, roofing felts, parapet walls, skylights, etc. And it will cost you only the trouble of asking for it.

JOHNS-MANVILLE JM PRODUCTS

*Reg. U. S. Pat. Off.

Let us send you the interesting booklet, "Things You Should Know About Your Roof." It gives complete information about the *free* J-M Roof Survey Plan together with the full story of the J-M Flexstone* Asbestos Roof and the Asbestile* Flashing System. Write Johns-Manville, Dept. PE, Box 158, New York 16, N. Y. In Canada, write 199 Bay St., Toronto 1, Ont.



Get this free survey now!

Johns-Manville, Box 158,
Dept. PE, New York 16, N. Y.

Please send me the free booklet, "Things You Should Know About Your Roof," and have your Approved Built-Up Roofing Contractor see us about making a free survey.

Name _____

Address _____

Johns-Manville *FLEXSTONE Built-Up Roofs**

ASBESTOS CORRUGATED TRANSITE* • ACOUSTICAL CEILINGS

DECORATIVE FLOORS • MOVABLE WALLS • ETC.

WHICH DO YOU DO?

LOADING & UNLOADING

SHEET FEEDING

WORK POSITIONING

DIE HANDLING

RAYMOND

PORTABLE *Hydraulic* ELEVATING TABLE

FITS ALL FOUR!

No table has so many practical uses as this RAYMOND Portable Hydraulic Elevating Table! Use it for positioning or handling throughout the plant . . . see how it lightens your work load. RAYMOND Hydraulic Elevating Table has sturdy 30" square top which can be rotated when desired.

Convenient foot pump simplifies raising and lowering, leaves operator's hands free. Smooth-rolling casters make table highly portable. Floor lock holds it securely in place. Standard Model elevates from 28" to 44"; Telescopic Model from 28" to 50". Both models have 2,000 lb. capacity.

SEND FOR BULLETIN 232

. . . it gives you the facts on this RAYMOND Portable Hydraulic Elevating Table. Write for it today.

RAYMOND

ELECTRIC INDUSTRIAL TRUCKS • HYDRAULIC ELEVATING EQUIPMENT

The RAYMOND CORPORATION

4369 Madison St., Greene, N. Y.

NEW PRODUCTS

(Begins on page 118)

est of which is 14 in. wide, 15 in. long and 5 in. deep. Bases to fit all three sizes are available for use when the tiers stand on the floor. Units are assembled with screw driver and wrench. Standard Pressed Steel Co.

Use the postage-free cards on pages 35-36 and 165-166 to ask for more information on these products. List item numbers on those products in which you are interested

24—TRUCK ATTACHMENT carries different size drums

This automatic, mechanically-operated drum-handling attachment handles different size drums two-at-a-time. It is attached to the truck by clamping it directly on the forks.

In operation, the driver tilts the mast backwards and engages the rear hook on each boom of the attachment with the near end of each drum. By moving the truck slowly forward and tilting the mast forward, the front hooks are engaged, while long tension springs keep the rear hooks in contact with the drums. Picking up the load locks the rear hooks. The Yale & Towne Mfg. Co.

25—HEAVY DUTY CUTOUTS of higher interrupting rating

These heavy duty cutouts, rated 5.2 kv, 100 and 200 amp, will interrupt short-circuit currents of 8000 amp at 5 kv and 12,000 amp 2.5 kv. The new 100-amp heavy duty cutout can be distinguished from standard duty cutouts by the reflector on the cutout door. Day or night, this reflector is visible from the ground, company points out. Distribution Transformer Div., General Electric Co.

26—CRAWLER-FORK LIFT for moving those big loads

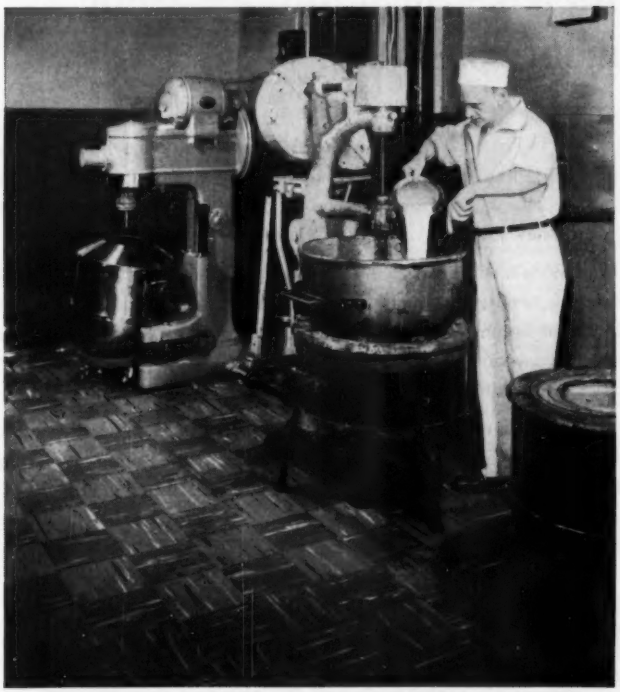
The Terra-Lift is expected to accommodate handling requirements for big loads both indoors and outdoors, in any weather and on any type of terrain without changing machines or equipment. Of the two models now offered, one has a 2000-lb. capacity and 8-ft 7-in. lift and the other a 4000-lb capacity with 6 ft lift. This new fork-lift is introduced as an addition to company's line of gasoline and diesel crawler tractors. Field tests are reported to show that the Terra-Lift can perform in mud 6-in. deep. Rubber track shoes for operational ease indoors are available. American Tractor Corp.

27—PLASTIC MATERIAL for sealing of vacuum lines

By adding a 1/64 in. film or coating to flange faces and gasket surfaces vac-

making the wrong choice can be dangerous here

...and the wrong floor can be costly, too!



Low initial cost plus years of heavy duty under the deteriorating effects of machine oils and greases, makes a SPECIAL (Greaseproof) KENTILE Floor ideal for installations like this.

THAT'S WHY IT PAYS TO CONSULT A KENTILE FLOORING CONTRACTOR

THE WRONG FLOOR in a specific installation can be overly expensive as well as impractical; resulting in underfoot safety hazards...excessive maintenance costs... too-frequent repairs or replacement. That's why progressive management as well as busy specifiers are learning to look to the Kentile Flooring Contractor for accurate and up-to-date information and advice.

He's a fully qualified flooring expert with years of training and experience... the right man to help you select the one floor that is best suited for your particular need...from the durable grease resistance required where floors are exposed to greases and oils to the luxurious flooring that best sets off executive offices.

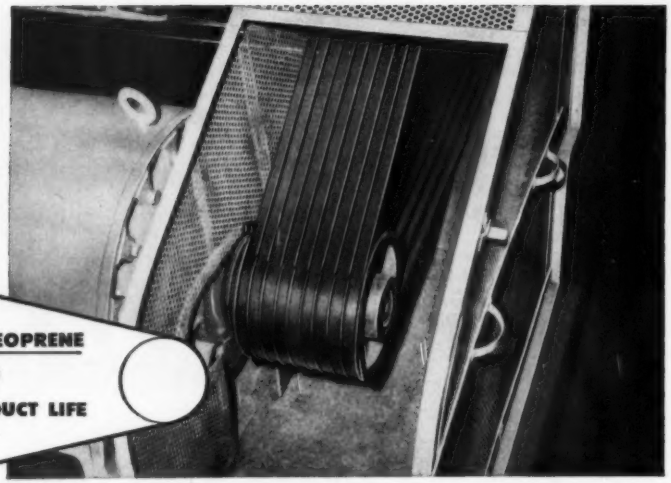
Whether you are interested in new construction or remodeling of existing facilities...flooring for areas large or small, call in a Kentile Flooring Contractor and be assured of spending your flooring dollars wisely. For his name, look under FLOORS in your classified phone directory, or write Kentile, Inc., Dept. XX-4, Brooklyn 15, New York. In Canada, T. Eaton Co., Ltd.

KENTILE INC.

KENTILE • KENRUBBER • KENCORK

SPECIAL (GREASEPROOF) KENTILE

KENTILE, INC., 58 Second Avenue, Brooklyn 15, New York • 350 Fifth Avenue, New York 1, N. Y. • 705 Architects Building, 17th and Sansom Streets, Philadelphia 3, Pennsylvania • 1211 NBC Building, Cleveland 14, Ohio • 900 Peachtree Street N.E., Atlanta 5, Georgia • 2020 Walnut Street, Kansas City 8, Missouri • 4532 South Kolin Avenue, Chicago 32, Illinois • 1113 Vine Street, Houston 1, Texas • 4501 Santa Fe Avenue, Los Angeles 58, California • 452 Statler Building, Boston 16, Massachusetts



ANOTHER CASE WHERE NEOPRENE MEANS INCREASED EFFICIENCY, LONGER PRODUCT LIFE

Neoprene V-belts resist heat, oil, abrasion . . . reduce replacement costs

Premature failure of V-belts can cause delays in production—particularly if belts are in hard-to-reach places. That's why so many manufacturers specify V-belts made with neoprene. Wherever these rugged belts are installed, they give lasting service under the toughest conditions.

Heat alone accounts for many failures in ordinary V-belts. But V-belts made with neoprene withstand heat to a remarkable degree without softening or becoming tacky. Lubricating oil and grease from bearings have little deteriorating effect on these durable belts. And neoprene's resistance to flexing results in long service life.

Thousands of other resilient products in every phase of industry owe their improved performance and longer service to the unique properties of Du Pont neoprene. While Du Pont makes no finished goods of neoprene, your rubber goods manufacturer or distributor will be glad to tell you about the neoprene products he supplies.

SEND FOR "THE NEOPRENE NOTEBOOK"
Each issue describes new, unusual applications of neoprene that will be of interest to you. E. I. du Pont de Nemours & Co. (Inc.), Rubber Chemicals Division F-10, Wilmington 98, Del.

DU PONT
REG. U.S. PAT. OFF.

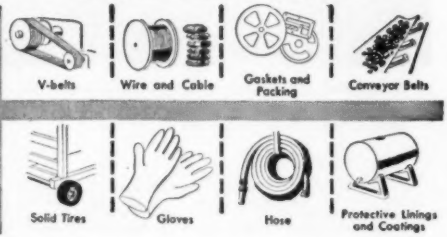
150th Anniversary

BETTER THINGS FOR BETTER LIVING...*THROUGH CHEMISTRY*

NEOPRENE

The Rubber Made by Du Pont Since 1932

Specify Neoprene in these products:



NEW PRODUCTS

(Begins on page 118)

uum line leakage is reduced to a minimum, manufacturer reports, and slight leakage occurring after the line has been in service can be corrected without dismantling the flanges by applying a 1/32 in. coating of the material

around the outside surfaces of the flange where they meet the gasket. This practice can be repeated over and over again to lengthen seal life.

Where flange faces are unmarred and come together true, the plastic gasket material can be used by itself without other gasketing material, it is pointed out, and the material won't harden after years of service. It is formulated in two types—one for air, steam, water and mild chemicals, and the other for oil, gasoline and solvents. Flexrock Co.

28—MERCURY SWITCHES in plastic potting compound

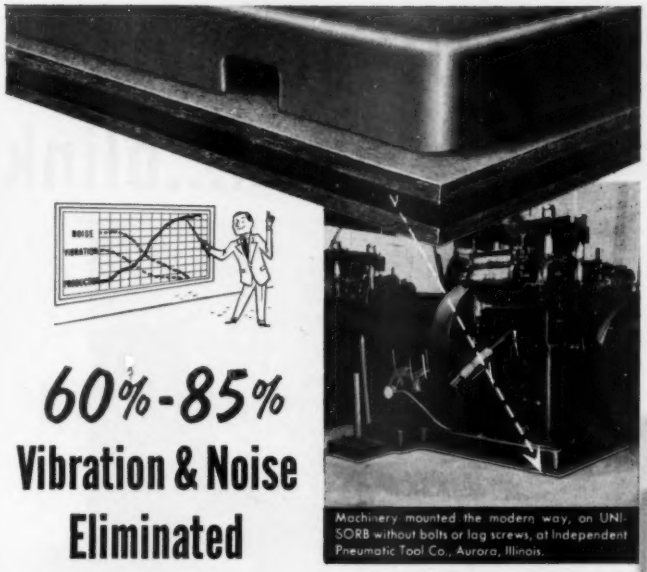
Although standard glass-enclosed mercury switches are sufficiently rugged for most switching jobs, this manufacturer points out that there are many applications requiring additional protection against mechanical shook, impact or other mechanical hazards. For these uses the embedded designs are suggested. They also offer additional means of mounting mercury switches.

First of the new switch asemblies, the IMPI, is 2½ in. long, ¾ in. wide and 1⅛ in. high, rated at 2 amp 115 v a-c or 1 amp 115 v d-c. Contact arrangement is single-pole normally open. Mounting holes accommodate ¼ in. screws, pins. Micro Switch, Div., Minneapolis-Honeywell Regulator Co.

29—ELECTRIC PAINT REMOVER takes it off in a hurry

Designed to remove paint through the use of radiant heat, this paint remover consists of two skids under which is mounted a tubular heater rated at 1000 w, 115 v. When the device is slid along a painted surface, the heat causes the paint to soften and blister and it can then be removed with a putty knife. Old paint can be taken off continuously as fast as the operator can scrape it off, according to company. The skids keep the heat a safe distance from the paint, and two metal reflectors serve to keep the handle cool.

The paint remover is 6 ft long, weighs 2¼ lb. Suggested retail price is $14.95,



60%-85% Vibration & Noise Eliminated

Machinery mounted the modern way, on UNISORB without bolts or lag screws, at Independent Pneumatic Tool Co., Aurora, Illinois.

When you mount machinery on...

UNISORB®

By eliminating transmitted machine vibration to a *proven* extent of 60 to 85%, UNISORB mounting prolongs building and floor life as well as the life of your machinery.

By considerably reducing the noise factor, UNISORB boosts worker morale and efficiency.

What's more, UNISORB requires no bolts or lag screws, makes old-fashioned floor drilling obsolete. A strong cement firmly bonds the UNISORB pads to machine feet and floor, with a holding strength of at least 90 lbs. per square inch.

Return the coupon today for complete information about modern machinery mounting.

UNISORB is also available pre-coated with adhesive, but is not recommended for use with machines that require shimming.

You Reduce VIBRATION NOISE MAINTENANCE

with UNISORB Mountings

- no bolts, no lag screws, no holes to be drilled, no floor damage
- Felters adhesive holds for keeps, yet permits re-positioning of machines. (Our UNISORB Booklet tells you how.)

THE FELTERS COMPANY

210-Z SOUTH STREET, BOSTON 11, MASS.

Offices: New York, Philadelphia, Chicago, Detroit, St. Louis
Sales Representative: San Francisco
Mills: Johnson City, New York; Millbury, Mass.; Jackson, Mich.

REPRESENTATIVES IN PRINCIPAL CITIES THROUGHOUT THE WORLD

MAIL COUPON FOR FREE BOOKLET TODAY!

Please send my free copy of the booklet containing the complete story of UNISORB Mounting.

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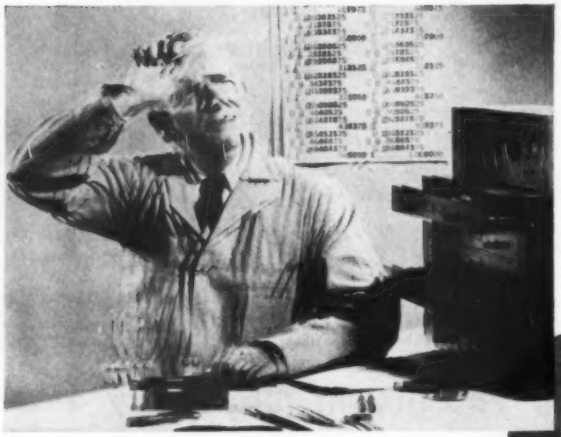
COMPANY .....
STREET .....
CITY ..... ZONE ..... STATE .....

STOP annoying blink...blink...blink



WITH WATCH DOG NO-BLINK FLUORESCENT STARTERS

Annoying fluorescent blink and excessive maintenance go hand in hand. Here's what Watch Dog* starters do about it.

- Watch Dog starters *stop blinking* by automatically turning off a failing fluorescent lamp.
- Watch Dog starters *keep the lamp off* until the red reset button is pushed when new lamp is installed. No recurring blinking every time the lights are turned on.
- Watch Dog no-blink starters *outlast* ordinary starters by as much as 10 to 1. Ballasts last longer, too.

You can stop the annoying blink of worn-out fluorescent lamps—cut starter replacement costs—cut ballast replacement costs—by seeing that *all* your fluorescent fixtures are equipped with General Electric Watch Dog no-blink starters.

Specify Watch Dog starters for new fixtures—insist on them for replacement. For a copy of folder Q33-1064, which gives all the facts on the Watch Dog starter line, write Construction Materials Division, General Electric Company, Bridgeport 2, Connecticut.

*Registered Trade-mark General Electric Company

For all replacement needs—use the famous Watch Dog no-blink starter with the red reset button.

And here is the tag to look for when you buy fluorescent fixtures. It is your guarantee that the fixture has been equipped with G-E Watch Dog no-blink starters.

You can put your confidence in—

GENERAL ELECTRIC

NEW PRODUCTS

(Begins on page 118)

including an 8-ft length of heavy duty electric cord. Industrial Heating Dept., General Electric Co.

30—ELECTRIC TRUCK is low-lift, shorter length walkie

A new addition to company's JackLift line is this low lift walkie truck of 4000- to 6000-lb capacity. Outstanding feature of the truck is an increase in power accomplished with a decrease

in over-all length. The significance of this is that the user will experience greater power when it is needed on ramps and grades, while at the same time less space is required for maneuvering loads. Company says the truck gives double power in less headroom.

Operational advantages announced for the truck include all controls in the handle head; vertical handle operation; electric deadman type brakes, and timed acceleration. Truck comes in both platform and pallet types. Lewis-Shepard Products, Inc.

31—STATIC-FREE BELT for conveying explosive material

The Mark 40, a new static-free belt is suggested for safely conveying materials under conditions in which a static charge is either undesirable or dangerous, such as bulk explosives, grain dust in elevators, and paper where a static charge may cause unwanted adherence to the belt.

This is a heavy duty stitched canvas with a smooth, conductive neoprene coating designed to dissipate any static charge before it is built up—without grounding wires or special equipment.

The belt comes in 37½ or 39 oz duck, in widths to 108 in. Main Belting Co.

32—PROCESS CONTROLLER features a short time cycle

A short-cycle time-proportioning relay has been developed for controlling nylon heat setting, linoleum curing, and metallurgical and laboratory-size furnace testing. The new model is part of manufacturer's Electr-O-Pulse line of relays and is intended to meet an increase in the number of processes having short time lags. Such processes, it is said, demand a pulse-type relay with short cycle time. Industrial Div., Minneapolis-Honeywell Regulator Co.

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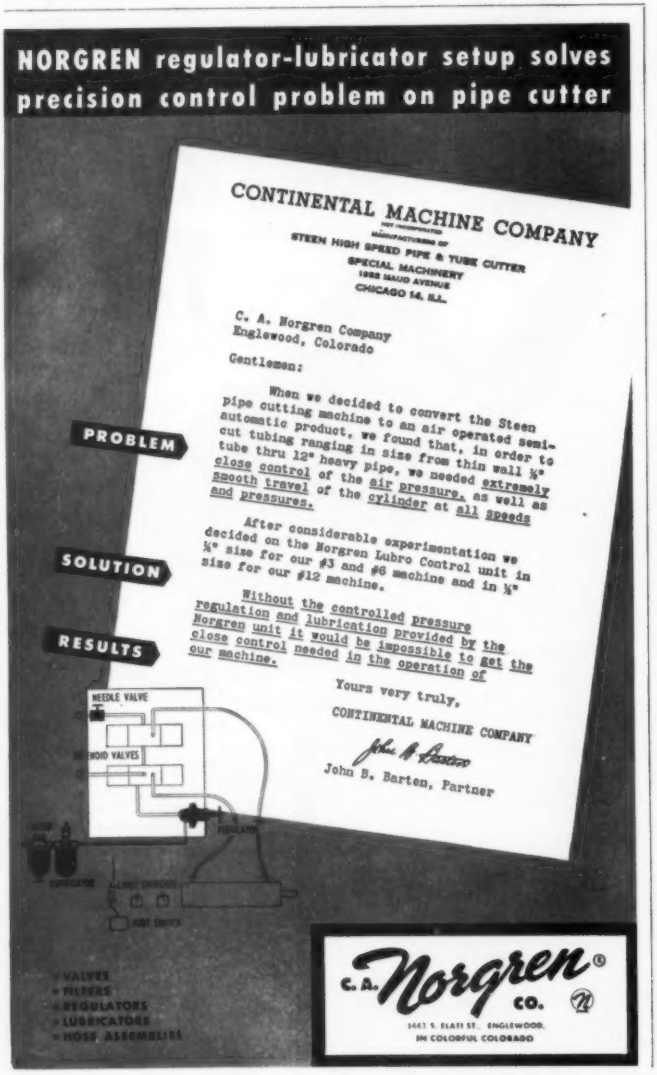
NEW BOOKS for the plant engineer's library

Measurement and Control

THE HANDBOOK OF MEASUREMENT AND CONTROL edited by M. F. Behar. Size 8¼ by 11¼ in.; 291 pp; illustrated; cloth bound. Published by Instruments Publishing Co., 921 Ridge Ave., Pittsburgh, Pa. Price $4.00.

THE SCIENCE of measurement and control is advancing very rapidly and every engineer who has anything to do with it must understand not only the basic principles but the latest development of details. This book offers that type of information.

The first part of the book shows how instrumentation interlocks with the fields of observation, measurement, transmission, control and analysis. This is followed by sections on thermometry, pyrometry, automatic control of temperature, flow rate measurement and control, positive liquid and gas meters, pressure and vacuum, speed measurement and control. Some of the other chapters are: Dimensional gaging and inspection, control valves and their application, and instrumentation in research. All the chapters are written by men well-known in their respective fields.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Industrial Trucks

STANDARDS for the Maintenance and Safe Operation of Industrial Trucks. Size 4¾ by 7¼ in.; 12 pp; paper bound. Published by the National Fire Protection Association, 60 Batterymarch St., Boston 10, Mass. Price 25c.

IMPROPER MAINTENANCE and operation of industrial trucks may lead to some serious trouble. To prevent potentially dangerous conditions wherever industrial trucks are used, this pamphlet presents some good advice.

It offers 16 recommendations for the safe maintenance of industrial trucks, as well as 26 safety operating rules. It also covers such items as gasoline handling and storage, hazardous areas, and lighting for operating areas.

Overfire Jets

APPLICATION OF OVERFIRE JETS to Prevent Smoke from Stationary Plants. Size 8½ by 11 in.; 24 pp; illustrated; paper bound. Published by Bituminous Coal Research, Inc., 2609 First National Bank Bldg., Pittsburgh 22, Pa. Price 50c.

THIS IS A revision of the famous BCR Technical Report No. 7. It begins with some general comments on the use of overfire jets to prevent smoke from stationary plants. Then it describes in detail the design and construction of blower jets and of steam air jets and silencers, also the construction of plain steam jets.

Data on location of jets, typical jet installations, control and care of overfire jets follow. In conclusion, a list of manufacturers of jets, control equipment and smoke alarms is presented.

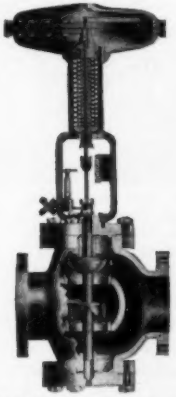
Code Rules Analyzed

ELECTRICAL CODE DIAGRAMS by B. Z. Segall. Size 8¼ by 11 in.; 343 pp; excluding index; illustrated; cloth bound. Published by McGraw Hill Book Co., Inc., 330 West 42nd St., New York 36, N. Y. Price $12.50.

THIS LARGE volume is an aid to a better understanding of some of the contents of the latest (1951) National Electrical Code. Its many clear diagrams help interpret different rules that appear in the code. In many cases text material is presented to further enlarge on different code conditions.

The book covers wiring design and protection, and wiring methods and materials. Theoretical and prac-

76 BS&B CLIMAX CONTROLS CENTERS



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tical aspects are both presented. The contents with the many years experience behind its preparation should make this volume a useful addition to a plant engineer's reference library.

On Letter Writing

WRITING FOR BUSINESS by C. W. Wilkinson, J. H. Menning and C. R. Anderson. Size 6 by 9 in.; 348 pp; cloth bound. Published by Richard D. Irwin, Inc., 3201 So. Michigan Ave., Chicago 16, Ill. Price $4.00.

THIS BOOK contains selected articles on business communication. It is planned as an aid to all who write business letters and that means practically everybody, and it is dedicated to the improvement of business correspondence. It contains over 60 articles on the theory and technique of business communication appearing the business magazines in recent years.

Here are some of the ten sections presented in the book: Basic principles of letter writing; attitude of the writer toward the reader; planning letters for clearness; conciseness and psychological effect; language of business and correspondence supervision and control.

Refractory Material Standards

MANUAL OF ASTM STANDARDS on Refractory Materials, prepared by ASTM Committee C-8. Size 6 by 9 in.; 304 pages; illustrated; paper binding; Published by American Society for Testing Materials, 1916 Race St., Philadelphia 3, Pa. Price $3.00, paper cover; $3.65, cloth.

THIS BOOK brings together in latest approved form 37 ASTM standard and tentative specifications, classifications, test methods, and definitions pertaining to refractories.

It includes data on testing and use of refractories not in the category of ASTM standards, such as a suggested procedure for calculating heat losses through furnace walls; suggested practice for use with ASTM panel spalling tests; suggested petrographic techniques, standard samples for chemical analysis and pyrometric cone equivalent determinations; and 12 surveys of refractory service conditions.

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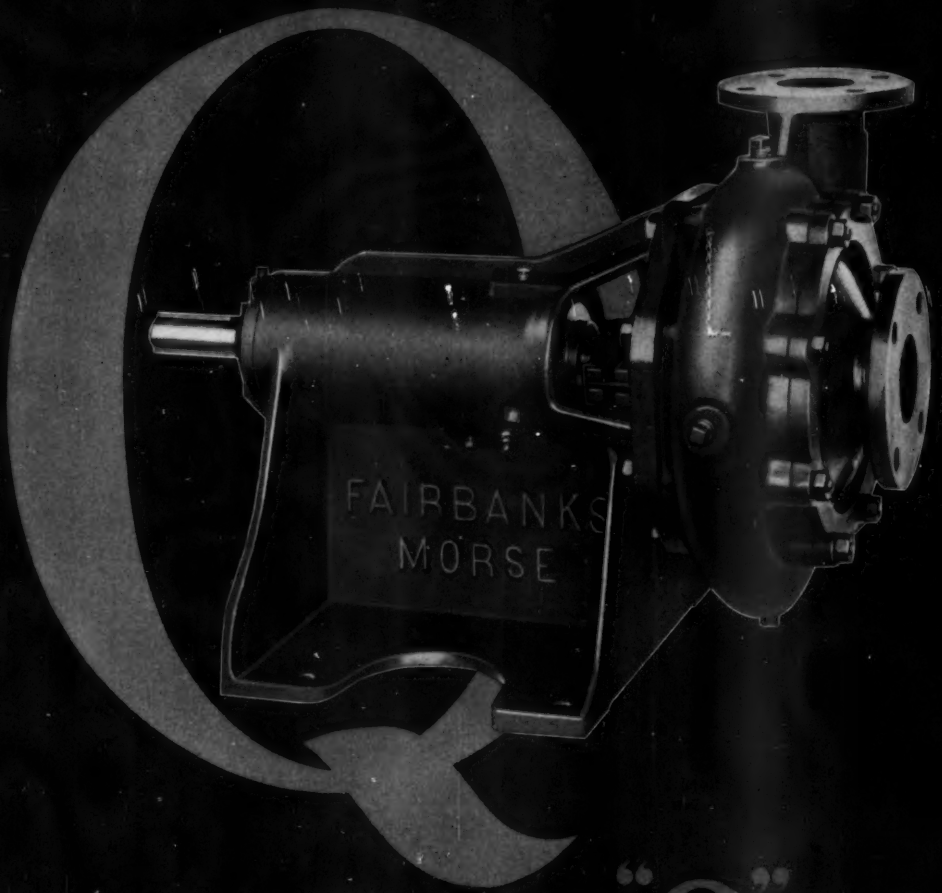

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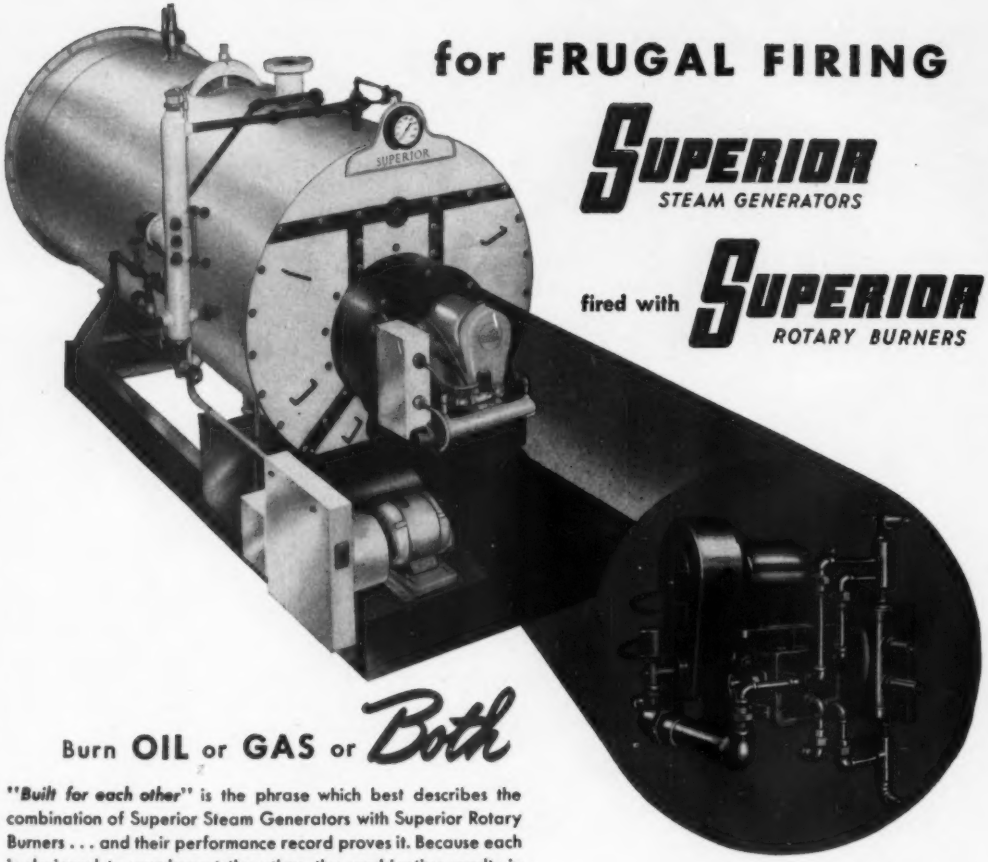

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SUPERIOR STEAM GENERATORS

(Continued from page 36)

141 Air Conditioners—Central station—cabinet type air conditioning units are illustrated and described in Bulletin 114. The functions and purposes of four commonly accepted types of unit assemblies are graphically presented by means of chart drawings and tabular matter. Plant engineers will find the check list of functional elements helpful in the preparation of specifications. National Association of Fan Manufacturers, Inc.

142 Data on Dust Filters—Bulletin 102 describes in detail manufacturer's new Dynaclone dust filter designed primarily for the continuous process industries where uniform suction at all dust points is essential. Gives complete engineering data on this equipment, including construction details, principle and applications. Includes hints on the engineering of dust control problems. The W. W. Sly Mfg. Co.

MECHANICAL POWER TRANSMISSION

143 Engineering Data on Flexible Couplings—Providing 78-pp of engineering information on company's line of all metal flexible couplings for power transmission, Catalog 51 is arranged for easy reference. Couplings are grouped and indexed, and keyway data, standards for straight and tapered bores, and ordering instructions included for each group. Standard couplings are shown in individual sections and followed by a section of special couplings. A wide range of horsepower and speeds covered. Book is available to qualified plant engineers; please state title when requesting this catalog. Thomas Flexible Coupling Co.

144 Cutting Gear Teeth—Publication M-1769 is a 60-pp handbook on the subject of cutting gear teeth on a milling machine. Covers milling of rack teeth, spur gear teeth, bevel gear teeth, helical gear teeth, worms and worm wheels. Fully illustrated with drawings and photos, picture equipment used, set-ups. Besides giving cutting procedures, the book includes a section of practical reference data including rules and formulas for gear calculations. The Cincinnati Milling Machine Co.

145 Air Cylinders—Bulletin A-106G uses only 8 pp to present complete engineering, design, construction and mounting data (including all mounting drawings) and dimension tables covering 13 mounting styles in 1½ through 14 in. bores. It's designed for easy selection of proper model. Covers cushioned and non-cushioned cylinders, single and double acting, single and double rod end, spring return and over-sized rod cylinders. Miller Motor Co.

VALVES, PIPING AND ACCESSORIES

146 New Valve Techniques—Sixteen-pp Technical Bulletin 106, "New Techniques in Control Valve Design," is described as one of the most comprehensive technical papers published on pneumatic final control elements. Presents a complete review of the development of present day conventional control valves and a look-see into future designs. Conoflow Corp.

147 Pipe Fabrication Standards—Standards Bulletin ES1-1952 titled, "End Preparation and Internal Machining for Machined Backing Rings for Butt Welds," supersedes previous standards bulletin. The new edition meets present-day high pressure and high temperature piping requirements and includes design changes that minimize amount of weld material required and resultant shrinkage stresses in the weld. Pipe Fabrication Institute.

148 Liquid Strainer—Application, parts list, working pressures and dimensions of company's Ideal liquid strainer are given in 8-pp Bulletin W-8. A diagram shows installation arrangements. Golden-Anderson Valve Specialty Co.

INDUSTRIAL HOSE

149 Metal Hose — Illustrated Catalog CMH-130, 32 pp, presents full range of company's Rex-Weld corrugated flexible metal hose, Rex-Tube convoluted hose types, and Rex-Flex stainless steel flexible metal hose, giving complete specifications. Also covers coupling types, special assemblies, and installation. Flexonics Corp.

150 Basic Industrial Hose—Illustrated in color, this 8-pp pamphlet describes company's new "Basic-Five" line of color-coded multi-purpose hose, which replace 18 former types and thus afford reduced inventories. Bulletin gives details of construction, sizes, lengths, pressures, recommended couplings and uses. Thermoid Co.

151 Handling Tar, Asphalt — Illustrated Bulletin CMH-114R, 2 pp, presents tar and asphalt hose and tank car unloading hose, giving full range of standard assemblies and engineering data. Flexonics Corp.

PLANT RECORDS

152 Simplified Preventive Maintenance—Stressing the value of pre-scheduled, controlled preventive maintenance in reducing down time and need for large emergency crews, Folder KD-705 explains how such a program can be handled with Kardex visible records. This system signals servicing dates of each machine, lists work to be done, records dates of accomplishment, requires a minimum of paper work. Folder also outlines Kardex property records. Remington Rand Inc.

153 Purchasing Case History—This 4-pp illustrated case history shows how Kardex visible purchasing records helped a manufacturer maintain a smooth running purchasing system. Records used include visible purchase history and quotation record and an open-order file housed in follow-up folders. Remington Rand Inc.

ENGINES, GENERATORS

154 Steam Generators—Twenty-pp Bulletin SH43, 20 pp, describes company's VL factory assembled generators combining 2-drum water-tube boiler, integral water cooled furnace, brick work, insulation and steel casing. A large cutaway illustration shows design details, and gas travel, circulation and furnace interior are also pictured. Use of the generator with various fuels and firing arrangements is covered, dimensions included. Erie City Iron Works.

155 Nitrogen Generator—Illustrated Bulletin HN-101 covers design and operation of company's Hi-Nitrogen generator, a self-contained combustion-method unit for low cost production of nitrogen from a mixture of air and natural or manufactured gas. Stresses economy, flexibility, low head room, other advantages. Tells applications in chemical and food proc-

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cessing, metallurgical, other industries. Gas Atmospheres, Inc.

157 For Economical Continuous Power—Spark ignition, totally enclosed gas engines are the subject of Bulletin S-550-B18A. This is a four-cycle engine of compact design and several installations are pictured. Ratings, specifications and principal dimensions accompany text covering applications and advantages. Worthington Corp.

SEALS, O-RINGS

158 Mechanical Seals—Excellent data on the design and use of mechanical seals for centrifugal pumps is provided in Bulletin 52-10000, 12 pp. Three types are presented: a low pressure single seal, an oil-lubricated double seal, and a balanced high pressure single seal. Cutaway drawings illustrate use of these seals. Helpful maintenance suggestions included. Byron Jackson Co.

159 O-Ring Application—This 16-pp illustrated booklet gives brief but comprehensive data on manufacture and application of "O-rings" as static and dynamic seals. Groove machining details for static and dynamic applications, both with and without "back-up" or "non-extrusion" washers, are given in chart form. The properties and characteristics of the basic polymers are outlined. ASTM and AMS specifications and applicable compounds shown. International Packings Corp.

OTHER EQUIPMENT

160 Controlled Humidification — How manufacturer's steam humidifiers serve to reduce weight and quality loss, as well as production and human efficiency loss and fire loss is told in 12-pp Bulletin 1773. Some causes of dry air are explained, and best methods of overcoming it discussed. Humidifying equipment is described and pictured and illustrated case histories of a dozen installations are provided. Also includes directions for installing the humidifiers. Armstrong Machine Works.

161 Silicone Notebook — Twenty-pp Booklet 2003 presents company's 200 Fluid, described as the simplest yet most unusual of the silicones. Generously illustrated by photos and charts, explains chemical structure of the group and discusses applications as instruments fluids, hydraulic fluids, liquid dielectrics, lubricants, water repellents, additives etc. Properties of the fluids are discussed in detail and a blending chart included. Dow Corning Corp.

162 Dermatitis Prevention Program—"The Control of Dermatitis in Industry" is a 32-pp booklet on prevention of the skin diseases which cost industry millions of dollars each year. Presents a simple, inexpensive program for providing personal cleanliness, protecting exposed skin areas, preventing clothing contamination, guarding against special hazards. Lists conditions to be checked to determine cause of dermatitis. A 6-pp chart covering a wide range of industries lists various working conditions and types of dermatitis prevalent, and suggests preventive measures. Brief descriptions of typical industrial skin troubles included. West Disinfecting Co.

163 Data on Industrial Plastics — Form 314, is a 16-pp general catalog describing 80 standard grades of Formica laminated plastics for industrial usage. Features a new edition of the Formica comparator chart. In it, major characteristics of each grade are described and a quantitative grading system permits easy choice of material best suited to requirements. Also shows typical uses of Formica in sheets, tubes, rods, molded and postformed shapes for electrical, chemical and mechanical applications. The Formica Co.

164 Separators for Textile Industry—Six-pp Brochure B-563 explains how magnetic separators provide simple, economical and efficient means of removing iron and steel trash from numerous wet or dry fibers. Describes with data and illustrations typical magnet installations in the processing of cotton, waste, wool, and wool-rayon blends. Also includes specifications for company's plate Automagnets, Automagnet pulleys, pneumatic assemblies and magnetic traps. Eriez Mfg. Co.

165 Motorized Chimney Draft—The advantages of mechanical draft in supplying positive, uniform, adequate draft, regardless of variable weather conditions or inadequate chimney or breeching construction are shown in detail in Bulletin I-52. Also discusses other advantages, including eliminating need for tall stacks. L. J. Wing Mfg. Co.

166 Business Know-How—This literature describes a course in business practice and management especially designed for engineers. Stresses value of this training as preparation for executive positions, lists subjects included. International Correspondence Schools.

167 Tough Alloy Castings—This new 48-pp publication on heat- and corrosion-resistant alloy castings, covers typical compositions regularly produced, their applications, limitations and types of service for which they are suitable. Over 175 photos illustrate applications and charts compare creep strength of various alloys, resistance to corrosion in certain media, and to oxidation at elevated temperatures. Tables of composition list principal Alloy Casting Institute designations, also proprietary alloys. International Nickel Co., Inc.

168 Heavy Duty Cutter—Bulletin 52-900 describes company's Hefti-Cut tool for heavy duty turning, facing, shaping and boring operations. Advantages of tool are discussed, including two-way blank adjustment and clamping arrangement which affords maximum carbide blank usage. Line drawings show construction and features, models available for different jobs. Brochure gives ordering data for all models and for carbide blanks with preformed angles. The DoAll Co.

169 Torsion Testing Machines—Twenty-pp Bulletin 43 gives complete data on company's line of electro-mechanical universal testing machines. Description of the pendulum lever weighing system, mechanical or hydraulic loading systems, electronic recorder and strain instruments. Tinius Olsen Testing Machine Co.

170 Industrial Insulations—Twenty-pp illustrated Catalog J-1, revised, describes insulating materials which cover the temperature range from -150 F to 1800 F. Insulating cement, block, blanket, felt and pipe covering are among products shown. Complete with thermal-conductivity graphs and heat loss charts, this catalog also shows prices. Includes brief application descriptions, sizes, packaging and densities. Baldwin-Hill Co.

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DATA FILE of literature for the plant library

STANDARD CATALOGS, bulletins and handbooks are listed to help plant engineers maintain a permanent data file. To get these free catalogs, list item numbers of those wanted on the postage-free cards provided on pages 35-36 and 165-166.

ELECTRICAL

201 Buyers' Manual on Motors and Control—Fifty-pp Catalog GEC-1009 presents buying information on a carefully selected group of motors, motor starters, control accessories and electronic control. Ratings listed are those most frequently required. Excellent selection data, dimensions, ratings and prices. General Electric Co.

202 Motor Panorama—Motors and generators—about 50 types in all—are pictured in Publication AEB 100.8B, which serves as a handy reference, since it lists specific literature dealing with each motor shown. Gives general construction details of each unit. Fairbanks, Morse & Co.

203 Enclosed Motors—Construction features and details of totally-enclosed, fan-cooled motors with tube-type air-to-air heat exchangers in ratings from 40 hp at 600 rpm through 800 hp at 3600 rpm are described in Bulletin 51B749B. Points out that these motors come in standard and explosion-proof designs, the former for applications without explosion hazards but requiring protection from dust, fumes. Allis-Chalmers Mfg. Co.

204 Motor Handbook — Bulletin MU-185 provides 66 pp of engineering and descriptive data on motors, covering splash-proof and explosion-proof types, gear motors, motors for use in chemical plants, for oil well pumping, punch presses, elevators, cranes and hoists. Wagner Electric Corp.

205 Bus Duct Manual—Booklet B-4272A, 68 pp, on bus duct and accessories, presents application and test data, specifications, information on pricing a typical installation. Describes advantages of bus duct for a secondary power distribution system, carrying current from transformers to switchgear—and from there to motors, etc. Westinghouse Electric Corp.

206 Power Distribution Feeders — Catalog TEB-1, 40 pp, on heavy-duty units for main feeders in distribution systems, gives construction, engineering, application data. Trumbull Dept., General Electric Co.

207 Overload Relays — Bulletin 1180-3 is a technical data sheet on overload relays designed to combine advantages of thermal and magnetic tripping characteristics for protecting a-c motors. Pictures design details. The Electric Controller & Mfg. Co.

208 Distribution Duct Engineering Data —Bulletin 427-4 contains 32 pp of data for estimating ventilated duct for feeder, circuits, plug-in duct, and plug-in duct for branch circuits. Includes instructions for laying out distribution duct jobs, and pointers on estimating diagrams, layout symbols. BullDog Electric Products Co.

209 Small Bus Duct—Detailed information on a midget-size bus duct is contained in Bulletin 703. Illustrates entire unit, also trap and hanger. Text discusses major parts, design features. Includes list prices. Frank Adam Electric Co.

210 Automatic Voltage Regulation—Bulletin S-351 provides 12-pp of excellent selection data on company's automatic voltage regulators of the instantaneous electronic and electro mechanical types. Explains principles of operation of both types, their special features and applications. The Superior Electric Co.

211 Battery Technology Handbook—This is a 56-pp revised edition of company's manual of technical instruction and engineering data on the care of motive power storage batteries. Major addition is a section on charging, which includes information on modified constant voltage and two-rate charging, boost, equalizing and emerging charging, control of discharge, etc. Other sections cover the theory of the lead-acid battery; practical tips on care and operation; maintenance and repair. Gould-National Batteries, Inc.

212 Preventive Maintenance Tips—Booklet B-5477, 28 pp, discusses programs designed to reduce shut-down time on production lines and treats in detail the maintenance of power equipment. A suggested schedule of work and cleaning on power equipment is presented in chart form. Essential information on preventive maintenance for turbines, generators, switchboards, motors and controls given. Westinghouse Electric Corp.

213 Electrical Equipment for Cranes — A complete line of electrical equipment designed exclusively for crane service is presented in 32-pp Bulletin C5-1. Covers everything from company's a-c Magnetorque crane control to current collectors, and is generously illustrated with photos, charts and drawings. Includes full data on motors, brakes, controllers. Overhead Crane Div., Harnischfeger Corp.

LIGHTING

214 Recommended Lighting Systems — This 16-pp article describes six lighting systems adaptable to most industrial plants. They include systems for illumination levels 20 to 40 ft-c, for levels of 40 to 60 ft-c and for levels of 60 to 100 ft-c, and involve use of filament, fluorescent, and mercury lighting and combinations of these. Explains lighting classifications, and discusses advantages of each type of lighting. Lamp Dept., General Electric Co.

215 Industrial Lighting at Work — Sixteen pp Booklet B-4727 stresses three ways of putting better lighting to work: cutting costs by promoting more production; increasing efficiency by ensuring accuracy, and reducing accidents by exposing dangerous operations. Analyzes mercury vapor and incandescent light sources as to efficiency, service life, maintenance, mounting height and job suitability. Luminaires of each type are pictured; wattage and lumen output ratings. Westinghouse Electric Co.

216 Precision Lamps—Bulletin 40 offers application and purchasing information on various types of lamps carried by manufacturer. Floods, infra-red, spatterproof, and weatherproof lamps are briefly discussed. Radiant Lamp Corp.

217 Plant Lighting Planning Guide — This 32-pp handbook of industrial lighting presents economics of a plant lighting program in terms of lower production costs, reduced working time, less fatigue and eyestrain, less spoilage, fewer accidents, better morale. Explains six major steps in initiating, developing and carrying out a lighting program; tells how to select equipment and stresses importance of maintenance. Includes table of recommended levels of illumination for industrial interiors. Benjamin Electric Co.

VALVES, TRAPS, PIPING AND ACCESSORIES

218 Efficient Flow Control — Data on bronze, iron, steel and corrosion-resisting valves in a wide range of types, for oil, common troubles as well as mysterious Shows how valves are designed for service, low maintenance. The Wm. Powell Co.

219 Iron Body Gate Valves—Bulletin 805, 8 pp, covers company's popular iron body, bronze trim gate valves in both outside screw and yoke and non-rising stem types, telling best applications for each. Design features explained. The Ohio Injector Co.

220 Small Steel Valves—Illustrated Circular 134 describes a line of small cast steel valves for high pressure service. Tells how valves are built, where to use them. Gives dimensions, weights, prices on both globe and angle types. Walworth Co.

221 Regulating Valves—Bulletin 313 describes double seated diaphragm regulating valves for use with control instruments, outlining special features of the valves, particularly the "flow line" contoured body designed to provide high capacity at low pressure drop. Leslie Co.

222 Pressure-Vacuum Vent Valves — Bulletin E-601, 24 pp, is devoted to combination pressure-vacuum vent valves, stressing their low upkeep costs, positive shut-off, automatic operation and other features. Two types are presented — a standard assembly, and one with flame arrester element especially suited for use on storage tanks containing flammable materials. Black, Sivalls & Bryson, Inc.

223 Steam Trap Reference Manual—Bulletin T-1740, 24 pp, tells why and where steam traps should be used; explains desirable trap features. Advantages of company's impulse steam traps are described, their operation illustrated. How to figure traps sizes and how to size condensate return lines are told and capacity and pipe dimension charts and thermodynamic properties of saturated steam included. Yarnall-Waring Co.

224 Steam Hook-ups—This 64-pp manual on hook-ups for steam traps, air vents and temperature controls provides diagrams, size calculators, selection data on traps and regulators, properties of saturated steam, dimensions. Sarco Co., Inc.

225 Steam Trap Book—Catalog J, 44 pp, includes physical data and prices on cast semi-steel and forged steel inverted bucket steam traps, compound steam traps and ball float air and air relief traps; a handbook section explaining how to calculate condensate loads and select traps for all classes of equipment; a maintenance section. Armstrong Machine Works.

226 Solving Steam Trap Problems—This popular 36-pp catalog on steam traps contains specifications and capacities on steam traps, float traps, air release valves and pipe line strainers. Tells how to calculate condensation loads and select traps for all classes of equipment, including unit heaters, jacketed kettles, autoclaves, submerged surfaces, steam mains and header drips. Gives pointers on how to install traps and service them. The V. D. Anderson Co.

228 To Stop Those Leaks—Catalog 41-0 offers 28 pp of helpful ordering and application data on pipe repair clamps and saddles, valve and bibb reseaters. Illustrates each product, tells where to use it and how to install it, giving dimensions and prices. M. B. Skinner Co.

229 Handbook on Fittings, Flanges — Catalog wf-1950, 68 pp offers working information on seamless carbon steel welding fittings and forged steel flanges. Includes dimensional tolerances, thread standards and threading practice; service pressure ratings, physical and chemical requirements. Grinnell Co., Inc.

230 Piping Pointers—This is company's popular piping manual covering fundamentals of sound piping practices. Discusses various types of valve designs and how each should be used. Pictures and names more than 80 kinds of fittings and contains many illustrated how-to-do-it features. Included with the manual is an 8-pp valve selection guide. Crane Co.

231 Design Properties of Pipe—This 12-pp booklet consists of tables listing pipe sizes and wall thicknesses currently established as standard, plus what is believed to be the most nearly complete tabulation ever published of dimensional properties of commerical steel pipe. Tube Turns, Inc.

232 Replaceable Air Filters—Form 481 is an illustrated data sheet on replaceable transparent bowl-type filters, ¾ and 1 in.

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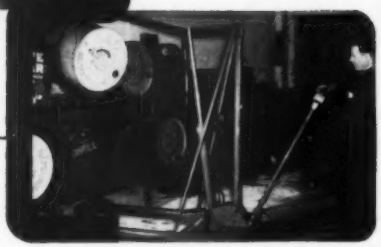

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VENTILATING, DEHUMIDIFYING, AIR CONDITIONING

233 Efficient Dehumidifying—Bulletin 222 is the 32-pp recent edition of company's popular booklet showing how modern dehumidifying equipment solves moisture problems for industry. Illustrated by 70 photos and diagrams of installations, describes many production, handling and storage problems solved by installing manufacturer's Lectrodryers. Covers their use in storage areas, in materials handling, spot drying. Pittsburgh Lectrodryer Corp.

234 Improved Air Conditioning—Advantages and applications of a controlled humidity method of air conditioning are discussed in Bulletin 112. Process is explained, illustrated. Niagara Blower Co.

235 Putting Air to Work—Catalog 600 is an excellent, 60-pp reference text on air and products to put it to work. For plant engineers concerned with heating and ventilating of plant areas; air conditioning installations; means of exhausting fumes, gases and dusts; conveying chips and granular materials; elimination of airborne dirt—this book is a valuable tool. It's packed with information on selecting and applying equipment, and there is a section of frequently-used reference data. Sturtevant Div., Westinghouse Electric Corp.

236 Versatile, Flexible Tubing—Catalog 5-4 is an 8-pp folder on Spiratube, a tubing made of spring wire within overlapping plies of spirally wound fabric and designed for a wide range of ventilating and conveying jobs. Special features are presented and four types of this tubing discussed. Flexible Tubing Corp.

237 Heavy Duty Ventilation Filters—Form DPF-100.LH presents a dry panel filter with a filtering area of 23 sq ft. Tells features, uses; includes installation data, filter selection chart. Dollinger Corp.

HEATING, COOLING

239 Heating, Air Conditioning Book—Bulletin PB-290, 36 pp, is a complete, condensed catalog covering company's full line of air conditioning, heating, ventilating and heat transfer equipment. Supplements some 40 specialized bulletins on various product lines. The Trane Co.

240 What Unit Heaters Can Do—Featuring many photos showing how unit heaters are being used to provide heating comfort, cut fuel costs, provide economical air circulation, 8-pp Bulletin 149-A discusses advantages of these heaters and includes performance data. Modine Mfg. Co.

241 Instantaneous Heaters—Besides explaining construction features which contribute to the efficiency of manufacturer's instantaneous heaters (two-, four- and six-pass hot water units) and how to select them, Bulletin 35-78 devotes 49 of its 56 pp to tabular material on capacities and pressure drops for 198 heaters. These cover 12 temperature ranges and nine steam pressures from 0 to 100 lb. Provides a dimension-weight-price table. American District Steam Co., Inc.

242 Heat Transfer Equipment—An excellent source of information on shell and tube heat transfer equipment, 28-pp Catalog DM-1150 covers heat exchangers, tank suction heaters, oil preheaters, condensers, evaporators, after-coolers, gas coolers, centrifugal pumps and water heaters. Instructions for installation, operation and maintenance are included. Bell & Gossett Co.

243 Industrial Dry Coolers—Illustrated Bulletin DC-50, 12 pp, presents dry cooling equipment for small, "in-between," and heavy-duty cooling jobs and includes three recent models. Two are small "portable" units and the third a medium-size unit. Although designed primarily for cooling engine jacket water, they can be used for cooling natural gas, lube oils, fluids of refining stages. The Marley Co., Inc.

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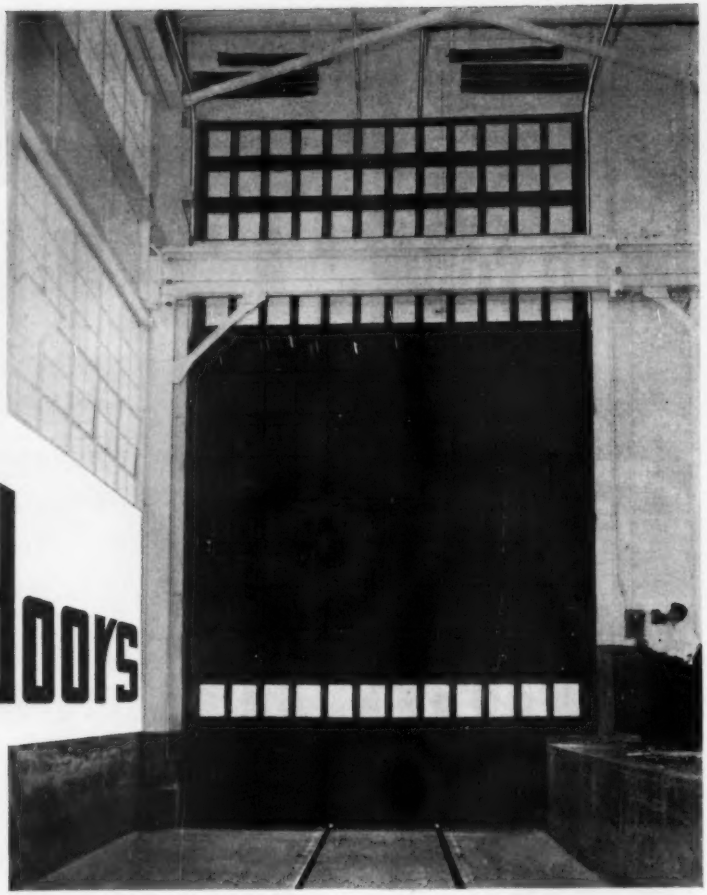

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It's a whopper. It's in a paper mill machinery plant, where everything is big. The opening alone is 19 feet wide and 22 feet high, and the door is 10 feet higher than the opening. Why the extra 10 feet of dummy sections on the door? Because, by our figuring, it was the *best* way to get behind the crane rail and high enough to clear the big crane. There are actually several ways to lick this "trouble", but our engineers decided to weight-counterbalance the bottom 10 feet of the door and spring-counterbalance the rest. They added several other features we have on hand for big doors like this, and the result is a smooth-running, trouble-free job. We are always looking for "trouble" of this kind . . .

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244 Jacket Water Coolers — Illustrated Catalog 1351 describes a line of engine jacket water coolers described as extremely rugged units capable of withstanding abuse of portable equipment installations. Details new design features of the units. Young Radiator Co.

DUST CONTROL

245 Dust Control—Bulletin 98 explains value of industrial dust control and principles of dust suppression, collection by filtration. Describes dust control equipment, providing specifications, dimensions on filters, systems, automatic controls. The W. W. Sly Mfg. Co.

246 Manual of Exhaust Hood Design—Bulletin 270-E1, 24 pp, features engineering data on dust control systems for the metal working industries. Illustrates and discusses the design of exhaust hoods for many operations in this field. Also, 61 photos of dust control installations show various methods of hooding dust sources. Includes tables of exhaust requirements. American Air Filter Co., Inc.

247 Wet Method Dust Collection — Besides presenting company's line of Multi-Wash dust collectors, dewatering tanks and pumps, 22-pp Bulletin 510 explains advantages of wet method of dust control, discusses both simple installations and those requiring additional equipment. Covers in detail the widely used Senior collector, the Junior collector for single function operations, settling and dewatering equipment. Claude B. Schneible Co.

248 Dust Control Brochure — Dust and fume control in many industries is the subject of this comprehensive 24-pp booklet. Tells how cloth-tube type dust collectors are handling complex problems in 33 typical installations, all illustrated. Covers use of these collectors in chemical processing, coal cleaning, sewage disposal, many other applications. American Wheelabrator & Equipment Corp.

MECHANICAL POWER TRANSMISSION

250 Belts to Suit the Job—This bulletin presents company's "inner-locked" woven duck belting available in types for general elevating and conveying and general power transmission applications as well as special jobs. Imperial Belting Co.

251 V-Belt Drive Design Book—Providing 54 pp of engineering data on manufacturer's Bull Dog belts, this catalog gives general drive information as well as simplified methods of selecting V-belt drives, V-flat drives and several types of non-standard drives. Includes selection tables, prices. Boston Woven Hose & Rubber Co.

"Wouldn't you know it! Twenty years in the maintenance department and here I am stumped by a little PENCIL SHARPENER!"

252 Improved V-Belts — This literature on company's Vulco rope drives explains how this rope with concave sides is designed to fill out to a precise fit in the sheave groove, to provide less wear, more pulley contact and more sure power when needed. The Gates Rubber Co.

253 Power Drive Handbook — Catalog 709, describing roller chains and sprockets, includes tips on selecting stock roller

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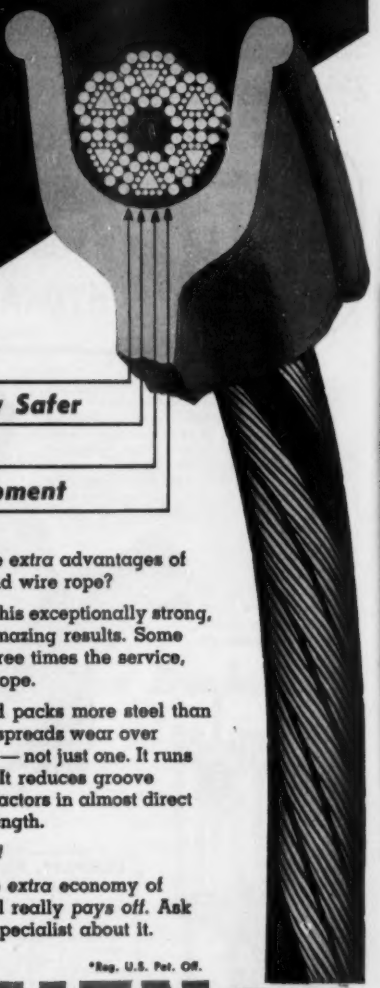

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chains for every type of power drive service. Diamond Chain Co., Inc.

254 Manual on Power Transmission Machinery—Containing 225 pp of data, this illustrated handbook covers roller bearings, V-belt drives, friction clutches, couplings, collars, sleeve bearings, pulleys, take-ups and hangers. Provides engineering data, formulas. Dodge Mfg. Corp.

255 Chart on Belt Care—In the interest of conserving power transmission belting, this manufacturer offers a cardboard wall chart on the care and maintenance of power driven belts. Carries sketches and brief text covering the steps to be taken to select the right belt, install it, use it correctly and keep it in good operating condition. Cling-Surface Co.

256 Block and Sheaves—Catalog 300-24 24 pp, covers manufacturer's complete line of blocks and sheaves. Provides block number, capacity in tons, number of sheaves, rope size and weight of each block. Illustrations, ratio table included. American Hoist & Derrick Co.

257 Unit Pillow Blocks—Literature is available on this manufacturer's newest pillow block featuring a Fairprene seal which retains lubricant, and set screws for easy installation. SKF Industries, Inc.

FUEL OILS, LUBRICANTS

258 Cooperative Technical Consultation Service—This 24-pp booklet presents company's periodic consultation service offered to industrial plants and aimed at efficient use of petroleum products. Covers services available in solution of lubrication problems, metalworking operations, processing, fuel and heating oils, dust control. Gulf Oil Corp., Gulf Refining Co.

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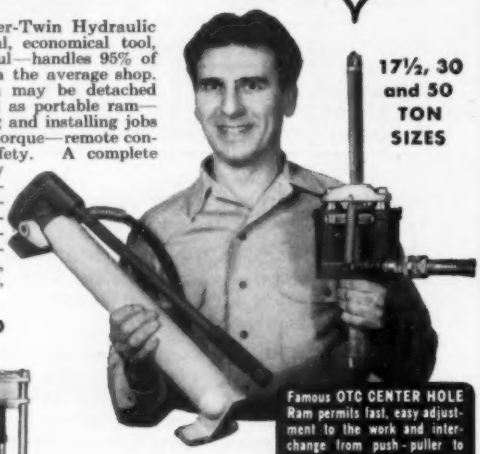

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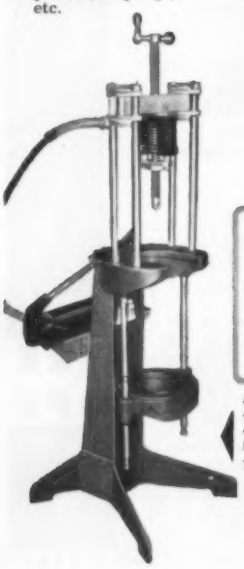

COMPACT, POWERFUL	17½	30	50
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Width	51½"	7"	8⅞"
Thickness	2"	3"	3½"
Ram Travel	2"	2½"	3"
Center Hole	1"-8	1¼"-7	1½"-6
Weight	18 lbs.	23 lbs.	48 lbs.

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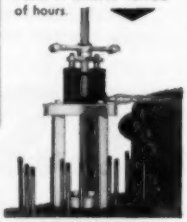
Pull or install cylinder sleeves with the OTC Power-Twin Hydraulic Puller in minutes instead of hours.



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259 The Why, What and How of Lubricants—This 20-pp booklet explains and illustrates common tests and terms describing lubricants. Covers viscosity, flash and fire, neutralization, number, penetration, specific gravity, extreme pressure, steam emulsion, corrosion. Tide Water Associated Oil Co.

260 Versatile Industrial Oil—Described in 20-pp Form AD 4078 is an all-purpose oil offering protection for a wide range of industrial equipment, and available in 15 viscosity grades. Discusses six major characteristics of the oil; explains and pictures its use in hydraulic systems, speed reducers, air compressors, electric motors, hydraulic turbines, bearing systems, etc. A chart shows grades and uses, physical properties. Standard Oil Co. (Ind.)

261 Lubrication of Diesel Engines—An excellent instruction manual, 50-pp Technical Bulletin B-1 (revised) also provides a brief history on diesel engines, an explanation of the fundamentals of design and the common types of diesels and their advantages. Explains combustion process, discusses modern fuel injection systems. Cylinder and bearing lubrication are treated in detail and recommendations given for lubricating oils. There's also a chapter on diesel fuels. Sun Oil Co.

262 Force Feed Lubricators—This catalog describes and illustrates force feed lubricators for positive and automatic lubrication of cylinders and bearings. Stresses accessibility of enclosed working parts, other design features. Manzel.

MAINTENANCE

264 Corrosion-Preventive Coatings—This 16-pp illustrated booklet covers a family of products for fighting corrosion. Presents characteristics and application data on hot and cold applied tar base coatings, alkyd resin coatings, chlorinated rubber base coatings, vinyl and phenolic coatings. Includes finder chart. Protective Coatings Div., Pittsburgh Coke & Chemical Co.

265 Building Maintenance — Handbook 7 offers 64 pp of information on floor surfacings, leak stoppers, external wall sealants, road patching, roofing materials. Includes instructions for use. Flexrock Co.

266 Floor Maintenance—This 12-pp brochure presents a complete and economical program for the care of wood and concrete floors, terrazzo, linoleum and tile. Points discussed include wear resistance, appearance, sanitation, cleanliness, light reflectance, sealers and hardeners, burnishing and buffing. The Tremco Mfg. Co.

See pages 35-36 and 165-166 for postage-free mailing cards. Use them to ask for bulletins—just list the item numbers of all those wanted.

267 Roofing Manual—Engineering data on roofing is given in Specifications 50, 30 pp. Covers coal tar pitch roofings, waterproofings, insulations, flashings, protective coatings. Includes illustrated instructions. Tar Products Div., Koppers Co., Inc.

268 Basic Roofing Information—"What You Should Know About Your Roof" is a 40-pp, clearly illustrated booklet which tells what makes a roof fail, how to recognize signs of roof deterioration, what to do to keep a roof in good condition. Discusses recommended roofing practices, essentials of a good re-roofing job, also, special features of company's roofing materials. Johns-Manville.

269 Iron Cement Handbook—This is a 40-pp pocket-size catalog of iron cements for repair, other uses. Tells how to mix and apply them. Gives illustrated instructions for dozens of repair and maintenance jobs. Smooth-On Mfg. Co.

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for space-saving storage.

Write or wire for prices today . . . or for engineering assistance on your handling problems or plans.

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270 Vacuum of Many Jobs — Bulletin 144, 20 pp, describes and illustrates 132 unusual industrial uses for company's vacuum system. The Spencer Turbine Co.

271 Power Sweepers—Bulletin S-101 pictures and describes power sweepers for industrial, commercial plants. Comparative operating data are given on each sweeper as a guide to selecting correct model and size. Chart showing savings in man hours and sweeping costs afforded is included. Wilshire Power Sweeper Co.

CONSTRUCTION

272 Standard Screw Products—This 10-pp booklet about "Unbrako" standards tells what they are and the advantages of their use. Gives detailed information on socket head, cap screws, self-locking socket set screws, socket set screw points, flat head socket cap screws, shoulder screws or stripper bolts. Standard Pressed Steel Co.

273 Technical Manual on Plywood — Available basic data on Douglas fir plywood, its properties and use, are offered in looseleaf sections with firm binder. Presents engineering information about this panel material and its performance in varying applications. Covers commercial standards, designing with plywood, prevention of condensation, lateral bearing strength of nailed plywood joints, deflection. Please give your title when requesting this book. Douglas Fir Plywood Assn.

274 To Nail It Right—Available for use with company's hardboards in plant construction work is the "Dial-It-Right, Nail-It-Right," a small cardboard reference wheel. The "Dial-It" side shows type and thickness of hardboard for exterior and interior walls, ceilings, underlayment wainscots, bench tops, doors and other uses. Reverse side gives nailing instruction. Masonite Corp.

275 Floors for the Job—The merits of selecting the proper flooring for any industrial installation is stressed in this literature. Explains how company is set up to offer assistance in choosing flooring to meet individual plant needs. Kentile Inc.

276 Non-Slip Flooring—Algrip, an abrasive rolled steel floor plate described as non-slip even on steep inclines, is the subject of Booklet A-5, 8 pp. Discusses safety features; gives fabricating data, sizes, allowable loads. Pictures some applications. Alan Wood Steel Co.

WIRE ROPE

277 To Keep Wire Rope at Work—Form 3547 is an 82-pp handbook titled "Here's How To Keep Your Wire Rope Working," and filled with practical tips on care and use of wire rope. Tells how wire rope is constructed, what types are suited to various jobs, how to install it. Covers such subjects as abrasion, lubrication, avoiding kinks, alignment of sheaves, winding on drums, bending fatigue, wire breaks, when to discard a wire rope. Wire Rope Divs., American Chain & Cable Co., Inc.

278 Wire Rope Handbook—Catalog G-15, 170 pp, is pocket-sized and thumb indexed, and one of the handiest available from standpoints of practical information, easy reference and clarity. Provides up-to-date information on a wide range of Preformed and regular type wire ropes, slings and fittings and includes a section of data helpful in selecting the right rope for the job, installing it properly and keeping it in condition to get best use from it. Macwhyte Co.

279 Wire Rope, How to Use It—Practical information on the use and care of wire rope is given in 72-pp pocket-size Catalog C-51. Covers unloading, storing, kinking, unreeling, installing, breaking in, methods of seizing and cutting, measuring, end preparations, many other pertinent factors. Fully illustrated with photos and sketches, treats splicing in detail and includes chapter on lubrication. Also presents data on wire rope constructions, efficiencies of fittings. Available to qualified plant engineers. A. Leschen & Sons Rope Co.

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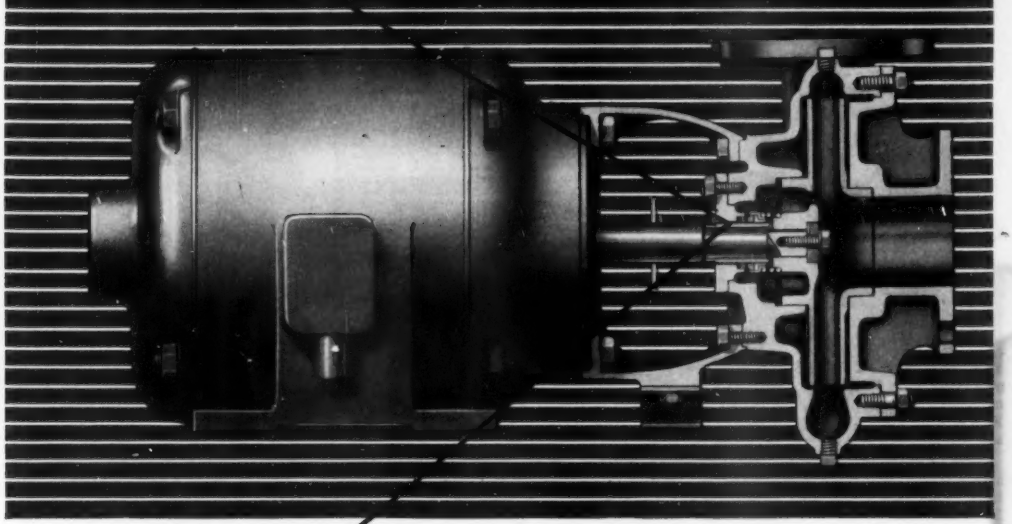
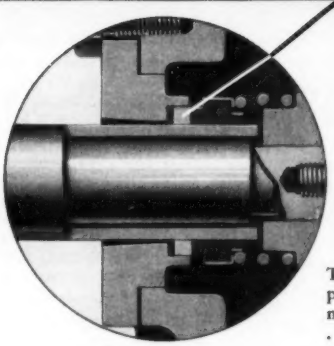
NEW *Remite* SEAL ENDS LEAKAGE TROUBLES





Cross-section showing Remite Mechanical Seal.

B&G *UNI-BUILT*

SERIES 1531 CENTRIFUGAL PUMP

The "REMITE" Mechanical Seal of this pump presents a revolutionary new development in pump design . . . eliminates leakage . . . assures long, trouble-free life.

A carbon seal ring faces on a "REMITE" floating seat—a new type of material, *so hard it will scratch glass*—wear-proof and corrosion-resistant! This Seal is self-lubricating.

Note the pump shaft . . . super-finished high grade steel . . . oversized for minimum deflection . . . quiet. The impeller is of sound hydraulic design, mechanically balanced, with balance ring and relief holes to reduce thrust. The heavy duty ball-bearing motor is normally furnished as drip-proof, but is also available in splash-proof, totally enclosed and explosion-proof models.

B & G Series 1531 Uni-built Pumps are made with capacities to 1200 GPM, heads to 400 feet.

Send today for catalog No. ET-452, giving complete engineering data on the B & G Series 1531 Uni-built Centrifugal Pump.

BELL & GOSSETT
COMPANY
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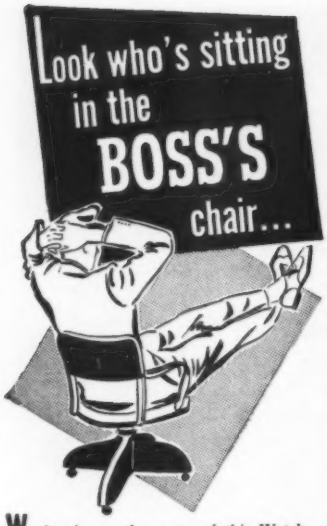
Canadian Licensee: S. A. Armstrong Ltd., 1400 O'Connor Drive, Toronto, Canada



Weekends are dreary—and this Watchman appreciates comfort. Since he is *not* supervised by a DETEX GUARDSMAN Watchclock, who is to know if he steals a few hours to relax in the boss's chair?

Sometimes nobody finds out until disaster strikes. Fire, which might easily have been controlled, guts the plant. Burglars break in. Vandals cause damage. What good does it do to bawl him out *after* the terrible fact?

Play Safe with GUARDSMAN

How much wiser and safer it is to supervise your Watchman with a GUARDSMAN tape-recording watchclock. Weekends, week days or extended holiday closings—the GUARDSMAN is always on the job, making a minute-by-minute record of your Watchman's whereabouts throughout his tour. If your Watchman sleeps, shirks or skips a round, you'll know it PDQ! Why ask for trouble? Write today for free circular on the GUARDSMAN, the low-cost, quickly-liquidated protector of thousands of plants throughout the world.

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WATCHMENS CLOCKS

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INSULATION

281 Heat Insulation—This 8-pp booklet on hydrous calcium silicate insulation is illustrated with graphs, tables and drawings showing numerous ways this insulation is used in industrial and commercial projects for temperatures up to 1200 F. Lists wide selection of shapes and sizes. Kaylo Div., Owens-Illinois Glass Co.

282 Pipe Insulation—Form 78-103 is a small folder stressing efficiency and economy of Amocel, a lightweight asbestos pipe insulation for temperatures to 650 F. Discusses its low thermal conductivity, high mechanical strength in relation to its weight. Union Asbestos & Rubber Co.

283 Fiberglas Bibliography—This is the new, 88-pp third edition of a volume of annotated references to selected articles on Fiberglas products which have appeared in the nation's press. Uses of Fiberglas products documented in the book include such applications as refrigerating equipment, water heaters, forced warm air furnaces, reinforced cable, storage batteries. Owens-Corning Fiberglas Corp.

INSTRUMENTS, CONTROLS

284 Fundamentals of Instrumentation—Booklet 80-2, just released, offers 126 pp of information on instrumentation in industry. Separate sections are devoted to the fundamentals of measurement and control, measurement of process variables, remote transmission of measurements, automatic controllers, power units and final control elements, control systems and panelboards. Illustrated. Available to qualified plant engineers. Brown Instruments Div., Minneapolis-Honeywell Regulator Co.

285 For Liquids Worth Storing—Bulletin 6405 offers an illustrated discussion of company's self-contained gages for liquid level applications, covering both direct- and remote-reading types, also a dial type hydrostatic gage. Stresses value of measuring stored liquids. Liquidometer Corp.

286 Heating-Air Conditioning Controls—A complete and informative ordering book for thermostats, motor-operated valves and accessories for heating, ventilating and air conditioning applications is offered in 48-pp Catalog F-1753-3. Compiled to aid in selection of control equipment to meet rigid specifications. Barber-Colman Co.

287 Time Saving Volt-Ammeter—Manual 110, 16 pp, "How to Make Your Job Easier with the Amprobe," describes the handiness of this pocket-size volt-ammeter in installing, repairing, servicing electrical equipment. Pyramid Instrument Corp.

288 Electrical Instruments — A line of instruments for production testing, plant maintenance and service is shown in 16-pp Bulletin A-16-B. Among these are a-c clamp volt ammeters and a-c clamp ammeters, circuit testers, analyzers, mutual conductance tubechecker, pocket-size meters. Weston Electrical Instrument Corp.

VIBRATION, SOUND CONTROL

289 Engineered Vibration Control—Bulletin 104 presents spring, cork and rubber mountings, discussing advantages of each and use alone or in combination. Provides helpful selection chart covering a wide range of machines, showing recommended and alternate methods of isolation. The Korfund Co., Inc.

290 Simplified Isolation — A simplified method of machine isolation which utilizes pads and cement is described in this small folder. Explains how it reduces maintenance cost. The Felters Co.

PUMPS, COMPRESSORS

292 Centrifugal Pump Handbooks—Two instruction booklets covering installation, operation and repair of company's single-stage single-suction and multi-stage centrifugal pumps are available. They include illustrated description of such late developments as Magic-Grip couplings, universal joint couplings with Magic-Grip

Avoid these Hidden Costs with Elwell-Parker Trucks

One Elwell-Parker industrial power truck gives you the muscle power of at least ten men. It safely performs many jobs impossible by manual means, and works 3 to 5 times faster. Due to the soaring costs of scarce common labor, E-P trucks pay for themselves many times during their 15 years or more of life. *In addition* to direct savings, Elwell-Parkers eliminate all the hidden costs of manual labor listed above. These extras increase payroll costs 40 to 50%. Thus E-P trucks pay "continuing extra dividends besides actual wage savings".

This E-P fork truck has made a 60% saving in man-hours. Request name.

***FREE BULLETIN** on "Industrial Logistics". Write for it and name your product. The Elwell-Parker Electric Co., 4179 St. Clair Avenue, Cleveland 3, Ohio.*

ELWELL-PARKER
Power Industrial Trucks
Since 1906

CUTS DUCT INSTALLATION TIME 50% IN AIR CONDITIONING INTERNATIONAL AMPHITHEATRE

Courtesy: Narowetz Heating & Ventilating Company, Chicago, Ill.

Listed and approved by Underwriters' Laboratories

New Cartridge-Powered MODEL 450

REMINGTON STUD DRIVER

Despite a close deadline, ductwork was installed in time for both political conventions by the Narowetz Heating & Ventilating Company of Chicago . . . with the help of the Model 450 Remington Stud Driver. This revolutionary tool's speed and efficiency saved time and cut costs.

The Model 450 is completely self-powered and engineered for safety . . . sets as high as 5 studs per minute in joining steel and wood structural pieces to concrete and steel surfaces.

Test-proved to be the world's finest and speediest fastening system, the Model 450 Remington Stud Driver is made by Remington Arms Company, Inc., *America's oldest sporting arms manufacturer*. Price for Model 450, complete with rugged steel carrying case—only $119.50. For further information, fill out and mail the coupon.

"If It's Remington—It's Right!"

Remington DU PONT

It's fast, easy and safe to operate the Remington Stud Driver

Simply hand-assemble stud and power cartridge, load as a unit in easy-to-open Remington Stud Driver and close.

Then press loaded Stud Driver firmly against work surface, depress safety lever, and pull trigger. Explosive charge imbeds stud solidly.

Remington Arms Company, Inc.
Industrial Sales Division, Dept. PE-10
939 Barnum Ave., Bridgeport 2, Connecticut

I am interested in obtaining detailed information on the Model 450 Remington Stud Driver.

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Firm _____

Position _____

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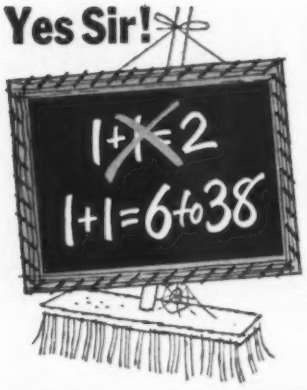
Yes Sir!



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1 man plus 1 Wilshire Power Sweeper sweeps 6 to 38 times faster than 1 man plus 1 broom. And Wilshire not only sweeps faster... it sweeps cleaner and without dust... inside and outside... wherever a man can handle a broom.

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In hundreds of companies in over 100 different industries, as well as in large cities and small communities, WILSHIRE Power Sweepers are cutting sweeping costs an average of 75%...even where only 1 broom-pusher formerly was used full-time.

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bushings, mechanical seals. Suggest regular inspection procedures and includes pages for maintenance records. Also provide handy reference tables explaining how to locate trouble and listing causes and cures. Bulletin 06X7813, 24 pp, covers single-stage pumps; Bulletin 06X7780 48 pp, covers the multi-stage pumps. State choice or both. Allis-Chalmers Mfg. Co.

293 Condensation Return Units—Bulletin 113-ST describes and illustrates packaged condensation return units for small, low pressure uses, covering pump capacities of 1½ to 22½ gpm. Aurora Pump Co.

294 Rotary Pump Service Manual—Although written for users of company's own rotary pumps and including a parts list, this little 20-pp booklet contains tips on installation and care applicable to practically all pumps of this type. Covers mounting, pipe connections, suction lines, pipe sizes, strainers, discharge lines, power, relief valves, speeds. Provides pointers on noisy operation, rapid wear, decreased capacity, loss of suction. Viking Pump Co.

"We're putting a few changes into effect, Harvey. Do you have your overalls handy?"

295 "A Turn for the Better"—Bulletin 30-B, 8 pp, discusses manufacturer's improved Moyno pump, explaining in detail its progressing cavity feature and showing how the rotary motion created provides continuous flow at positive pressure. Stresses performance advantages of the pump. Pump Div., Robbins & Myers, Inc.

296 Self-Priming Motor Pumps — Form 7240 describes and illustrates automatic operation and construction features of pumps, intended for pumping applications under suction lift where presence of air or vapor in liquid makes it impractical to use conventional-type centrifugal pumps. Includes selection chart, dimensional data. Cameron Pump Div., Ingersoll-Rand Co.

297 Compressor Selection Chart — Based on normal applications handling air with atmospheric intake pressure, this chart simplifies selection of proper size compressor, giving quick comparison between discharge pressure pounds per square inch gage and piston displacement cubic feet per minute. The chart shows recommended compressor bore and stroke in inches. Worthington Corp.

298 Air Compressor Selection Data—Factors to be considered in selecting a compressor are discussed and selector charts provided in 20-pp Bulletin IDC 9302-3, covering manufacturer's V and G air compressors. The V line includes tank mounted and bedplate units, single- and two-stage types. Special features of each model are described, dimensions and ratings given. Westinghouse Air Brake Co.

299 Multi-Stage Compressors — Featured in 36-pp Bulletin 116 is a presentation of engineering data and performance characteristics to enable plant engineers to approximate power requirements, rotative speed and discharge temperature for most multi-stage centrifugal compressor applications. Clark Bros. Co., Inc.

LIKE AN **ATOM-IC** EXPLOSION

Just 1/32" (pinhole size) faucet leak
MUSHROOMS into ATOMIC WASTE
of approximately 95,000 gallons • of water yearly—costing:

$24.14

@ $1.90 per M cubic feet

If a hot water faucet, drip (actual) FUEL WASTED heating 95,000 gallons costs approximately:

$88.91 if coal (9870 lbs.)†
$91.08 if oil (792 gals.)†
$84.41 if gas (84,414 cu. ft.)†

Above figures authenticated by Hackensack Water Co.* and American Gas Association.†

STOP this needless WASTE during today's MATERIAL and MANPOWER shortages with "SEXAUER" "Easy-Tite" that outwear ordinary faucet washers 6-to-1, thus SAVING labor on 5 REPEAT repairs, PLUS water and fuel, while prolonging the life of SCARCE fixtures.

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"EASY-TITE" FAUCET WASHERS

...a modern laboratory triumph, are compounded from du PONT NEOPRENE (tested up to 300°F.) instead of rubber—to withstand DESTRUCTIVE HEAT common in present-day super-heating water systems—that formerly broke down washer's structure.

Built like a tire with fabric re-inforcement they resist the grinding, closing squeeze that SPLIT and MUSH ordinary washers out of shape... causing LEAKS.

Through combining NEOPRENE and FABRIC RE-INFORCEMENT they OUTWEAR ordinary washers 6-to-1 on hot or cold FAUCETS—thus you slash water, fuel and labor costs.

THE NEW 'SEXAUER' CATALOG

Edition G, just out, pictures over 2500 TRIPLE-WEAR plumbing REPAIR parts and Pat'd. Precision Tools. It's today's accepted buying guide for discriminating purchasing and maintenance personnel among thousands of top PLANTS, INSTITUTIONS and GOVT. AGENCIES that rely on SEXAUER repair materials. Send for your copy today!

Then too, there's a SEXAUER TECHNICIAN with a quick call from coast-to-coast, who offers a special SURVEY service that sets up a schedule of the exact replacement parts required for your particular plumbing fixture regardless of make or age and *without obligation.*

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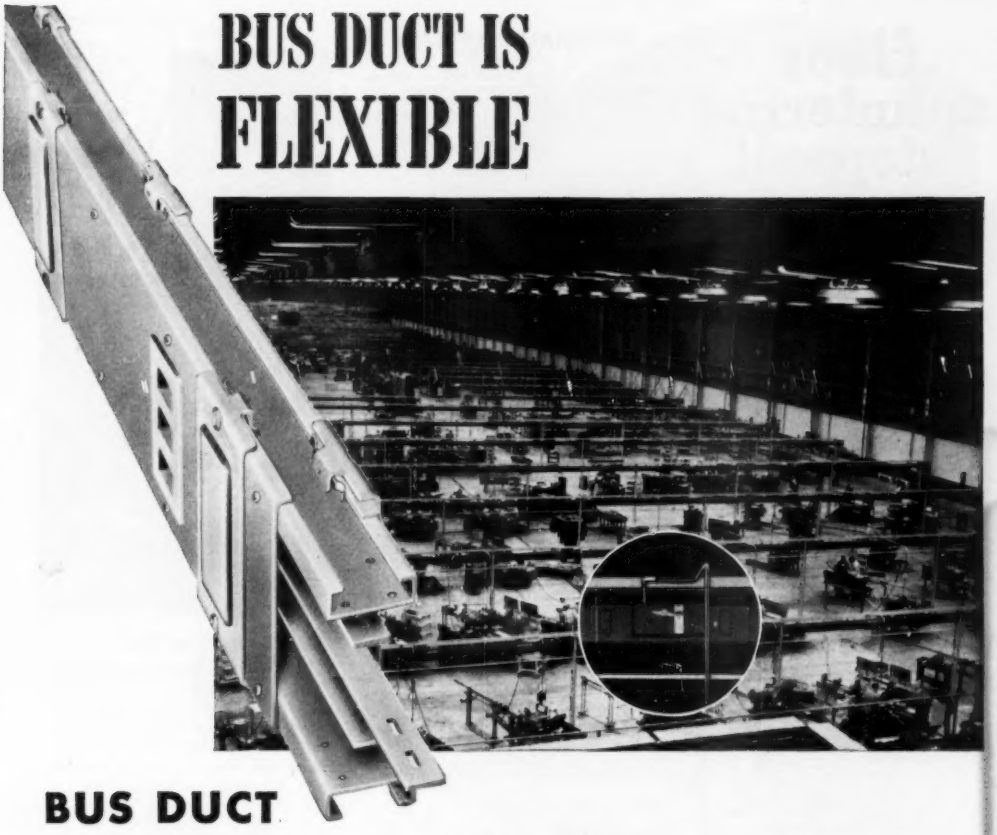
WORLD'S LEADING SPECIALISTS IN PLUMBING AND HEATING REPAIR PARTS

BUS DUCT IS FLEXIBLE



BUS DUCT solves high bay distribution problem

Mounting on angle iron standards proves highly flexible

An extremely high bay created a serious secondary power distribution problem at the Tulsa Plant of the Douglas Aircraft Company.

Douglas solved the problem uniquely, by mounting 4,600 feet of 400 ampere, 3-wire, 3-phase, Westinghouse Plug-In Bus Duct from angle iron standards resting on the floor. Unequaled plant layout flexibility resulted.

All Bus Duct runs are convenient to machines and exposed to view. They're mounted high enough to be out of the way, but low enough to plug in or service easily. (See circle inset.) No material is wasted with long, unnecessary lead-ins to machines; no time is lost checking circuit feeds. Machines can be shifted without affecting Duct.

Perhaps this manner of Bus Duct installation can be applied to solve a similar problem in your plant or building. Four types of Westinghouse Bus Duct are available for any service demand up to 5,000 amperes.

Get complete details from your Westinghouse Representative or write for B-4272-A, Westinghouse Electric Corp., P. O. Box 868, Pittsburgh 30, Penna.

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BUS DUCT

floor splintering stopped!

Business can't run smoothly on rough floors. Materials handling is especially tough—unless the floor has been especially toughened, as this one was, in the immaculate plant of Wildroot, Inc., Buffalo, N. Y.

TREMCO MEN EXPERIENCE

...gained by solving floor problems for a quarter century, makes effective results possible at low cost. Tremco Man J. P. Hurd planned this economical floor saving program. There is a Tremco Man like him near you—and there is no obligation for his inspection and advice.

Inspection, by Tremco Man Hurd, showed that impact and scuffing of heavy drums caused severe dusting and splintering. He recommended "mechanical hardening" and sealing of the wood surface with Penetrem to obtain a smooth, durable, easy to clean floor. Tremco methods keep Wildroot's floors—both concrete and wood—smoother, harder, easier to clean. For your copy of "Industrial Floor Maintenance," write The Tremco Manufacturing Co., Cleveland, Ohio or The Tremco Manufacturing Co. (Canada) Ltd., Toronto.

TREMCO

PRODUCTS AND METHODS FOR BUILDING MAINTENANCE

UM-1023

MATERIALS HANDLING

300 **Space Saving Fork Trucks**—Operational features, engineering details and maintenance advantages of maufacturer's Spacemaster electric fork trucks are described and illustrated in recently published Catalog 32, 20 pp. Trucks covered are from 1000- to 4000-lb capacity. Also included are special purpose attachments. Lewis-Shepard Products Inc.

301 **Shovel and Loader** — Described in 12 pp Bulletin 1032 is a hydraulic crown and hoist shovel and loader incorporating mechanical features usually associated with big shovels. Illustrates, gives specifications, application information on both pneumatic traction and crawler traction models. Dempster Bros., Inc.

302 **Materials Handling Equipment** — Illustrated Catalog P602 is a 44-pp guidebook on materials handling equipment for industrial plants. Subjects covered include description and application data on company's gas and electric fork lift trucks, motorized hand trucks, hand lift trucks and hand and electric hoists. The Yale & Towne Mfg. Co.

303 **Industrial Logistics** — Form A-9516-4450 is a 12-pp booklet covering strategic handling of materials from raw state to distribution. Discusses master unit load and transportation cycle. Explains company's system of adapting all loads to four types of containers, assembling maximum numbers of these into master unit loads, and transporting them as single units. The Elwell-Parker Electric Co.

304 **Safe Truck Operation** — "Safety Saves!" is a 24-pp booklet setting forth "do's" and "don'ts" established as a practical code of truck operation. The admonitions, pointed up by cartoons, serve as both "refresher course" and text. Industrial Truck Div., Clark Equipment Co.

305 **Hydraulic Lift Trucks**—This catalog provides engineering and ordering information on manufacturer's complete Weld-Bilt line of hydraulic lift trucks in 2500- to 10,000-lb capacities. Also covers skid platforms, pallet lift trucks, two-wheel trucks. West Bend Equipment Corp.

306 **All-Purpose Lifts**—"Let Big Joe Do It" is a bulletin on hydraulic lifting units. Features a heavy duty model for lifting loads to 52 in. height. Big Joe Mfg. Co.

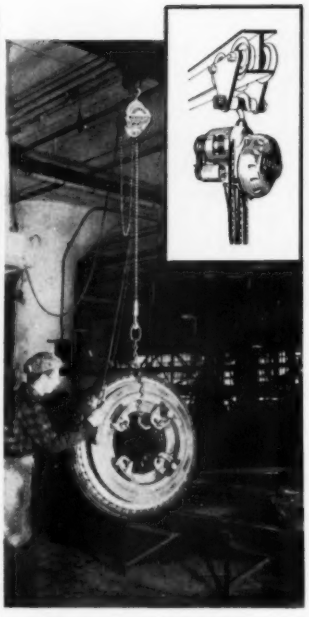
307 **Three-Job Unit** — This bulletin on company's portable conveyor-loader-stacker features an easy-to-use dimensional chart showing loading and unloading heights and other major dimensions. Also includes specifications, data on optional equipment. The E. W. Buschman Co., Inc.

Three no-postage cards make it easy for you to order any of this literature. See pages 35-36 and 165-166.

308 **Steel Wire Pallets**—This is an illustrated specification sheet covering a basic steel pallet for shipping, storing, and stacking jobs. Mesh detail and some typical applications are pictured. Union Steel Products Co.

309 **Elevating Table** — Bulletin 206 describes and pictures manufacturer's line of hydraulic elevating tables. Models shown can be used for die handling, or positioning, also strip and sheet feeding operations; capacities range from 2000 to 20,000 lb. Specifications given. The Raymond Corp.

310 **For Overhead Handling**— This 12-pp illustrated catalog covers motorized and hand operated cranes and monorails engineered for efficient, low-cost handling. Special construction features are detailed; accessory equipment shown. Abell-Howe Co.



LICKS THE WORK — NOT THE WORKER

Manual lifting quickly gives workers that licked feeling. But, with a tireless 'Budgit' Electric Hoist to save muscles, young men, women, older men keep defense and civilian production rolling.

The 'Budgit' Hoist converts electricity into powerful hoisting action. Every capacity — from 250 to 4,000 pounds. Uses only a few cents worth of electricity to lift loads all day. Operators retain their efficiency, avoid the hazards of lifting.

Every 'Budgit' Hoist is a complete lifting unit in itself! No extras to buy. Just hang it up, plug into the nearest electric socket, and use! A.C. and D.C. models. Prices start at $119. For more detailed information, write for Bulletin No. 391.

'BUDGIT' CONDUCTOR CORD TROLLEYS— keep flexible conductor cord up out of way while carrying electricity to monorail hoists. Roll smoothly around curves, past switches.

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'Budgit'® **HOISTS**

MANNING, MAXWELL & MOORE, INC.
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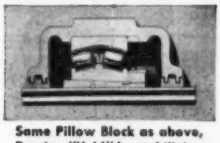
Builders of "Shaw-Box" Cranes, 'Budgit' and 'Load Lifter' Hoists and other lifting specialties. Makers of 'Ashcroft' Gauges, 'Hancock' Valves, 'Consolidated' Safety and Relief Valves, and 'American' Industrial Instruments.

If dirt's your problem

here's the answer -

SKF TRIPLE-SEAL "SAF" PILLOW BLOCKS

"Free" Spherical Roller Bearing.



Same Pillow Block as above, Bearing "Held" by stabilizing ring.

"Free" Ball Bearing.

Same Pillow Block as above, Bearing "Held" by stabilizing ring.

Here's *why* the Series SAF Pillow Block is SKF's answer to your problems:

- Triple-Seal rotating rings give positive protection in dirty locations; effectively seal out foreign matter; seal in oil or grease.
- Stabilizing ring between the housing shoulder and the bearing insure fixed position of one held bearing on the shaft and prevents end movement of the shaft.
- Adapter-type bearings permit use of standard shafting, yet provides a *tight fit*.
- Easy to install and inspect; self-aligning.

Write SKF for Folder No. 340 (for complete details), or contact your SKF Distributor.

SKF INDUSTRIES, INC., PHILA. 32, PA. — *manufacturers of* **SKF** *and* HESS-BRIGHT *bearings.*

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BEARINGS AND PILLOW BLOCKS

SLY

Pioneers and Leaders in INDUSTRIAL DUST CONTROL

Sly Dust Filter used for the collection of fine, float, silica dust in a large southern California plant.

SLY will solve your Dust Problem

- Fifty years' experience with literally thousands of successful installations.

Sly Dust Filters are used on such difficult dust as powdered sugar, bentonite clay, paint and pigments, aspirin and other pharmaceuticals, chemicals of all kinds, talc, lime, detergents.

Sly Dust Filters are not expensive. A Sly engineer is near you to discuss your problem with you. Ask for Bulletin 98.

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311 Fast-Working Hoists — Bulletin W-815-B, 6 pp, provides electrical details on company's hoists — on wiring, brakes, motors and fast-operating, push-button controls. Standard outrig, and multi-speed controls, limit switches are described. Hoist & Crane Div., Robbins & Myers, Inc.

312 Trolley Hoists—Bulletin DH-269, 2 pp, describes and pictures ½ to 3 t capacity army-type trolley hoists, plain or geared, for use where a close headroom assembly is required. Gives dimensional and capacity data, prices. Wright Hoist Div., American Chain & Cable Co., Inc.

313 Electric Hoist Manual—Catalog 215-B offers 38 pp of engineering, application and ordering information on company's Load Lifter electric hoists. Presents hoists with hand operated trolleys and with power travel, hoists with lug suspension, hook suspension and push-type trolleys, and with hand-geared trolleys, hoists for low head. Manning, Maxwell & Moore, Inc.

314 Chain Hoists — Catalog 61, 32 pp, covers a line of chain hoists, telling how to select and use them. Provides an illustrated comparison chart of hoist types, a selector table and discussion of factors to be considered in buying a hoist. Multiple gear chain hoists, screw gear chain hoists, differential chain hoists described separately. Reading Crane & Hoist Corp.

315 Industrial Lifts—This booklet presents a wide range of elevating equipment designed to step up efficiency and cut handling costs. Covers dock lifts, crossover bridges, sidewalk elevators, truck service lifts. The Wayne Pump Co.

316 Sheet Lifters—Operational and design features of company's sheet lifting equipment which contribute toward efficient handling, flexibility and economy are explained in Bulletin S-25, 16 pp. Cullen-Friestedt Co.

317 Data on Truck Casters — As much specific information as can be presented in a catalog for commercial usage is included in 105-pp Catalog 124 on truck casters. Besides specifications, ordering data and photos, this well-indexed book includes load capacity charts, defines caster terminology, tells how to select casters and install them. The Bassick Co.

318 Trucks, Casters, Wheels — Catalog 50, 65 pp, covers platform trucks, superstructures, two-wheel and pry trucks, dollies, trailers, casters, wheels, offering a wide range of chassis, superstructure and wheel combinations. Thomas Truck & Caster Co.

319 For Efficient Overhead Handling — Bulletin C-1, 56 pp, pictures overhead equipment for practically all industries. Stresses construction, safety, electrical advantages of trolleys, cranes, track and auxiliaries. Includes layout information. The American MonoRail Co.

320 Data on Tramrail Equipment — Twelve-pp Form 2006F is a recently revised booklet on tramrail systems. Tells what an installation can do toward improving

HINGED PLATEGRIP

BELT FASTENER No. 500

FOR HEAVY CONVEYOR BELTS OF CHANGING LENGTH

These heavy-duty belt fasteners make a strong, flexible joint in conveyor belts, belts of any width and of from ⅜" to ½" thickness. They offer special advantages in mines, quarries or industrial setups where length or position of belt is frequently changed, because sections can be removed or added at will. Joints are opened for this purpose by simply pulling out the hinge pin.

Easily and quickly applied on the job or in the shop. Special design gives deep compression into belting and smooth, flush joint.

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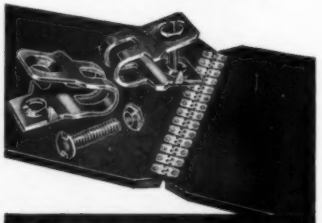

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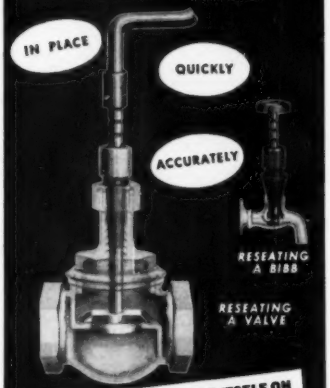
IN PLACE
QUICKLY
ACCURATELY



PAYS FOR ITSELF ON FIRST 2 OR 3 JOBS!

Don't junk expensive globe or angle valves, bibbs, fixtures—reseat them! Order Skinner *Valve and Bibb Reseater*. Easy to use. Guaranteed cutters leave seat glass-smooth, level, tight.

1/4" to 2" $38.75
1/4" to 3" $49.80

M. B. SKINNER CO.
SOUTH BEND 21, INDIANA, U. S. A.

Blames Faulty Packing For Big Shipping Losses
The nation's shippers are suffering a $160,000,000 loss annually through damage to goods in transit, according to Arthur H. Schwietert, director of traffic of the Chicago Assn. of Commerce and Industry.
He spoke as a panel member in the 1st annual Traffic & Transportation Conference & Seminar Thursday at Northwestern University's downtown campus.
Schwietert said damage claims paid out by Class I railroads alone in 1950 ran to nearly $85,000,000. He blamed faulty interior packing for a large part of the damages and urged a "continuous concentration in loss and damage prevention."
Light Runs, Good
HERE'S USP's ANSWER TO SHIPPING LOSSES
USP
Welded Steel Wire
Flat Fold
PALLETAINERS

Shipping damage and loss reduced to practically zero! That's the amazing record wherever USP Palletainers replace conventional containers for such products as forgings, castings, machine parts, bulk materials and food products. Light, resilient, economical and virtually indestructible, USP welded steel wire Palletainers safely transport shipments up to 4,000 lbs. Palletainers fold flat for reduced rate return.

But that's not all! USP Palletainers are also revolutionizing materials handling by saving man power, speeding work flow, conserving storage and warehouse space. Let us give you complete information.

Whether you need a container for shipment, storage or in-plant transport have a USP materials handling engineer discuss with you the proper Palletainer application for your job.

GENTLEMEN: Please have a USP materials handling engineer contact us for a discussion on Palletainers.

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UNION STEEL PRODUCTS CO.

Wire Products Division

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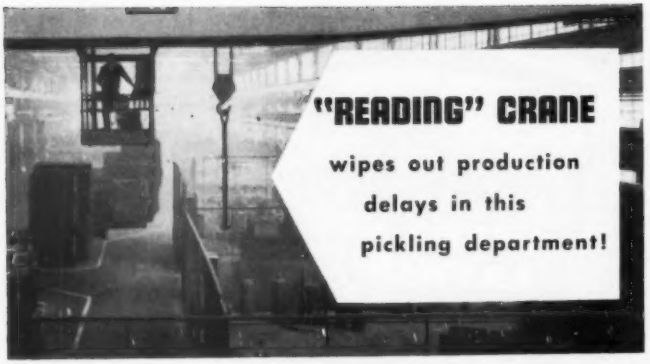

A prominent producer of automobile frames found production slipping. Figuring it was due to inefficient load handling equipment in his pickling room, he called in a "Reading" handling engineer.

After installing a 10-ton "Reading" overhead traveling crane he found his problem solved. Now the operator simply pushes a button. The motorized crane, traveling 400 feet per minute, does all the work.

Employee morale is higher because fatigue is eliminated. And the extra efficiency obtained resulted in improved production.

Further information on "Reading" Electric Cranes will enable you to judge their advantages for your own load handling operations. Get our latest 16-page bulletin, "The *Why* and *How* of Faster Production. Write to:

Chain Hoists
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Overhead
Traveling
Cranes

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READING CRANES

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Still the Best Answer to Your

DUST and FUME PROBLEM

CENTRI-MERGE is COMPLETELY automatic in every phase of operation, COLLECTS dust and fumes as soon as they occur, CLEANS by high pressure water action, DISPOSES by mechanical conveyor. Dust and fumes are forced back on a stream of air to collection unit, washed and scrubbed from the air into tank below, permanently trapped under water for quick disposal as sludge.

Our engineers will be pleased to consult with you in the solution of your problem.

Here are Several Reasons Why—

1. **CENTRI-MERGE** greatly reduces heating cost by re-circulating cleaned air in many cases, occupies a minimum of valuable floor space, is easily installed.
2. **CENTRI-MERGE** gives non-fluctuating cleaning efficiency every minute of the day, collects and disposes of dust and fumes immediately.
3. **CENTRI-MERGE** operates at constant efficiency during many years of trouble-free service.
4. **CENTRI-MERGE** eliminates health or fire hazard in dust control by its automatic removal as sludge.
5. **CENTRI-MERGE** is always dependable, never requires a shutdown during working hours for cleaning or routine maintenance.
6. **CENTRI-MERGE** is engineered for minimum maintenance expense, is a compact, self-contained unit, constructed for flexibility of arrangement to suit plant requirements.

THE Sand-Air PLUMB of CENTRI-MERGE

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Engineers & Manufacturers

304 Piquette, Detroit 2, Mich.

handling efficiency. Rail and arch design, switches, cranes and transfer bridges, carries, hoists, cranes, buckets, grabs are pictured. Cleveland Tramrail Div., The Cleveland Crane & Engineering Co.

321 Handbook on Overhead Conveying Systems — Manual A-56 provides 200 pp of information on overhead track systems and conveying equipment. Pictures installations, construction details; gives engineering data. Richards-Wilcox Mfg. Co.

322 Conveyor and Elevator Belts — This 26-pp collection of catalog sections illustrates parts used in construction of company's conveyor and elevator belts. Discusses increased service life and decreased maintenance. The B. F. Goodrich Co.

323 Metal Conveyor Belts—This 24-pp booklet is an illustrated guide to selection of metal conveyor belts. Presents both conventional and balanced spiral weave belt; covers raised edge and flight constructions, chain edge constructions, high temperature belts, wire conveyor aprons. Wickwire Spencer Steel Div., The Colorado Fuel & Iron Corp.

324 Feeders, Conveyors — An excellent presentation of electric vibrating feeders and conveyors is given in 90-pp Catalog 830 covering manufacturer's line of equipment for handling a wide variety of wet and dry materials and including large and small capacity units, for temperatures of -30 to 2000 F. Explains principles of design, operations. The Jeffrey Mfg. Co.

325 Belt Conveyor Idlers—Bulletin 51-81, 42 pp, presents latest developments of company's belt conveyor idlers and machinery. Includes engineering information helpful in designing and specifying belt idler equipment and cross-section drawings of both steel and cast gray iron idler rolls. New data on a return belt training (self aligning) idler is given, together with material on steep-angle troughed belt idlers and troughed belt self-aligning idlers. Information on lubrication material and techniques provided. Chain Belt Co.

326 Pneumatic Conveying — Technical information and data on handling bulk materials with company's Airstream conveyors are presented in 24-pp Bulletin 529. Diagrams basic types, charts principal applications. Includes case history studies in various industries to illustrate advantages. Dracco Corp.

327 Fastenings for Conveyor Belts — This collection of data covers hinged fastenings, repair plates, lacings, hooks, round belt couplings, also lacers, cutters. Gives instructions for use. Armstrong-Bray & Co.

TOOLS

329 Pipe Tool Book—This catalog and data book gives information on pipe and bolt machines, power units, ratchet threaders, reamers and cutters, other power and hand tools. Includes popular "operating guide" section, fully illustrated with easy-to-grasp drawings. Beaver Pipe Tools, Inc.

330 For Faster Fastening — Form 35-A explains and illustrates company's system of fastening tools and fasteners for use with steel, wood, concrete, fabricated hard materials. Ramset Fastening System, Inc.

331 Tube Working Handbook — Form 369-A is a 32-pp booklet on tube working tools. A section on modern tube working practices covers handling, cutting, flaring, reaming, refacing or fittings, bending, soldering and other operations. Company's line of tools is described. The Imperial Brass Mfg. Co.

332 More Holes in a Hurry—Form 2400 is a 36-pp pocket-size booklet which not only provides ordering information on manufacturer's drills, but also gives some excellent tips on how to get the most service from portable electric drills. Discusses motor, drill cord, drill chuck, right and wrong drill bit grindings, drilling of various materials, and drill maintenance. Includes tap drill sizes. Mall Tool Co.

333 Idea Book — Sixty pages of "1001 Shortcuts" for production, construction

From time card to travel ticket

Every angle completely covered . . . but one! When fire strikes during the night your skilled labor may go in the morning. The fully experienced Joes, Bills and Toms can't stand the financial strain of waiting . . . their time cards can become travel tickets to new jobs, while you're struggling to replace the ravages of fire.

The threat of losing your skilled labor due to an unexpected fire tragedy can be fully eliminated. With C-O-TWO Smoke or Heat Fire Detecting Systems plus C-O-TWO High Pressure or Low Pressure Carbon Dioxide Type Fire Extinguishing Systems your plant can have fast, positive, round-the-clock fire watchman service simultaneously at each fire hazard point.

At locations where a deep-seated, smoldering internal fire as well as a fast burning external fire might occur, the smoke detector of a C-O-TWO Smoke Fire Detecting System, based on an exclusive operating principle, automatically detects the first trace of smoke, smoldering or fire.

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Then clean, dry, non-conducting, non-damaging carbon dioxide is instantly released from either a C-O-TWO High Pressure or Low Pressure Carbon Dioxide Type Fire Extinguishing System into the threatened area. The fire is out in seconds with little if any interruption to operations and the carbon dioxide disappears without a trace . . . one of the safest fire extinguishing agents known . . . harmless to equipment, materials and finishes.

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Don't take chances with your investment. Secure the benefits of highly efficient fire protection engineering today . . . our extensive experience over the years is at your disposal without obligation. Get the facts now!

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MANUFACTURERS OF APPROVED FIRE PROTECTION EQUIPMENT

Squeez-Grip Carbon Dioxide Type Fire Extinguishers
Dry Chemical Type Fire Extinguishers
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EASY SHEET HANDLING *with a* C-F LIFTER

C-F Lifters are made in sizes to handle 2 to 60 tons in standard and semi-special designs.

This is the easy way to move sheet steel. One man and this C-F Lifter can handle many tons of sheets per day with ease, speed and economy. C-F Lifters have infinite opening and closing adjustments of the jaws permitting them to handle many varying sheet widths. These adjustments are made by the operator in a few seconds.

If your production involves the use of sheet steel, a C-F Lifter will save you many times its cost in the handling speed and economies it will effect.

Write for the bulletin "C-F Lifters." It illustrates the many advantages of these material handling tools.

HANDLE SHEETS with C-F LIFTERS

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Prevent this LOSS with Mall Pneumatic Shop Tools

Turn out more work, easier, faster, with lightweight, vibrationless tools that reduce fatigue to an absolute maximum. Typical of Mall compactness and precision in pneumatic tools is this No. PG-K1030L Lever Throttle Die Grinder, weighing only ¾ of a pound and easily held in the palm of the hand. With a guaranteed speed of 30,000 rpm. and a maximum of .0015 runout at the collet, this Mall Pneumatic Die Grinder assures accuracy, precision and ease of operation.

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and maintenance make this hand-tool and hydraulic-tool handbook one of the most useful ever. Large photos and concise descriptions give ideas developed and successfully applied by hundreds of tool users. One of the big values attached to the "Idea Book" comes from the manner in which it stimulates the user to create his own ideas. Typical job photos suggest the general principles of the applications. Blackhawk Mfg. Co.

334 **Powerful Puller**—Introduced in Bulletin 97-A is the compact Power-Twin, a fast-working hydraulic ram. Shows how this ram, with its center hole feature, can convert all of company's pulling systems to hydraulic push, pull or lift operation. Owatonna Tool Co.

335 **Stud Driver**—Special operating features of company's Model 450, a self-powered quick fastening tool, are detailed in Form 937A. Photos show how the driver is used and picture it in action. Industrial Tool Div., Remington Arms Co., Inc.

SAFETY, SANITATION

336 **Dry Chemical Extinguishers** — New quick-acting fire extinguishers of the dry chemical type in 20 and 30 lb sizes are covered in Form C-104. C-O-TWO Fire Equipment Co.

337 **Protective Creams**—This folder describes three creams with antiseptic as well as protective qualities, giving suggestions for use. Includes list of more than 175 hazardous substances telling which cream offers best protection against each. West Disinfecting Co.

MAGNETIC EQUIPMENT

338 **Magnetic Selection Guide** — Twelve-pp illustrated Catalog C-5000-B, describing manufacturer's entire line of magnetic separators and lifting magnets serves as handy guide to the selection of magnets. Dings Magnetic Separator Co.

339 **Metal Detector** — Catalog E-41 describes the RCA utility metal detector, a protective device for indicating the presence of metallic particles magnetic or non-magnetic, in open or packaged non-metallic materials. Eries Mfg. Co.

340 **Magnets in Stock**—A complete listing of stocked sizes and shapes of Carboloy Alnico permanent magnets is provided in 20-pp Bulletin FM-100. Contains pull curve and size information in tabular form on both cast and sintered types, as well as sizes and application data on hodling assemblies, including sheet steel separators, magnetic retrievers and stands. A list of available patterns for various sizes of cast Alnico bars, blocks, rods, rings and sleeves is included, also tables of properties. Carboloy Dept., General Electric Co.

Use the postage-free cards provided for you on pages 35-36 and 165-166 for requesting catalogs. List item numbers of those wanted.

BOILERS, GENERATORS

341 **Packaged Steam Generators** — This new 16-pp booklet on steam generators is profusely illustrated in color, providing photos, cut-away and schematic drawings and describing in detail the construction and operating principles. Explains induced draft, dry steam, four-pass downdraft design, 5 sq ft of heating surface per Bhp, flexibility of operation, and oil, gas and combination gas-oil burning equipment. Superior Combustion Industries, Inc.

342 **Re-Circulation Steam Generator** — Here's a 6-pp folder introducing a controlled re-circulation steam generator, de-

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Finest all-steel construction, smooth, rigid working surfaces, free-sliding, carefully fitted doors, and roller bearing drawers make HALLOWELL Cabinet Benches outstanding. Simple, functional design blends perfectly with industrial interiors. Standard unit accessories permit you to *custom build* HALLOWELL Benches to your requirements. Write for descriptive literature. STANDARD PRESSED STEEL CO., Jenkintown 26, Penna.

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MAKES it easy for ONE MAN to lift capacity loads to tail-gate heights.

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ARE PREFERRED by industry for today's materials handling operations.

The powerful hydraulic assembly requires minimum effort.

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LOOK TO THE FUSE LEADER FOR PRODUCTION PROGRESS

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THE FIRST COOL OPERATING FUSE · · · DESIGNED BY WARE

WARE HI-LAG *Renewable* FUSES

Cool Facts No. 2

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Spring tension, double contact area on link.

Links centered in all casings.

Double Fibre Bridge for Alignment and Strength.

Screws Locked—Only one wrench needed.

Insert either end in Casing. Minimum of parts.

APPROVED BY UNDERWRITERS' LABORATORIES

The Fuse That Science Built Cool to Prevent Excessive Heating During Heavy Current Loads and Long Service

When you make that next fuse installation, consider the World's Best and Coolest Operating Fuse—try WARE HI-LAG.

You will then see for yourself how the WARE HI-LAG stays cool under conditions that ordinarily cause overheating—you will see why its good business to standardize on a product that ends costly delays—needless production shutdowns and interruptions.

There's higher lag for motor starting overloads—stronger lag for operating current surges—lower contact resistance, reduced heating and larger and stronger terminal connections. The double-bridge assembly at left is another cool construction feature, helping to lower contact resistance and excessive heating.

WARE FUSE CORPORATION
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scribing its developments and uses. Combustion Engineering-Superheater, Inc.

343 Two-Drum Boilers—This new 16-pp bulletin describes two-drum boilers of the integral furnace type, giving information and dimensional data on company's 3-VC and 4-VC designs, both available for oil, gas or stoker firing. Typical installations for various types of firing are pictured. Erie City Iron Works.

OTHER EQUIPMENT

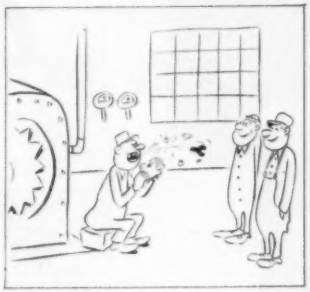
345 Overhead Doors and Operators — This 16-pp catalog on manufacturer's Overdoors and electric operating equipment explains and illustrates their outstanding features and describes standard models. Engineering data provided include specifications, construction and installation details, and building requirements. Barber-Colman Co.

346 Elevated Steel Tanks—Weldec steel tanks with ellipsoidal bottoms and roofs are presented in this 24-pp booklet as an economical means of increasing plant water storage capacity, maintaining uniform pressure. Chicago Bridge & Iron Co.

347 Plumbing and Heating Supplies—Edition F is a 118-pp catalog listing over 2500 repair parts and precision tools for maintenance of all types of plumbing fixtures. Fully illustrated, includes plumbing fixtures. J. A. Sexauer Mfg. Co., Inc.

348 Blowers and Accessories — Engineering and dimensional information on low, medium and high capacity blowers is given in this recently-released 6-pp bulletin. Pictures some installations, also accessories. Blower-Stoker Div., Read Standard Corp.

349 Solder Text—This 36-pp book is basically an editorial treatise. Separate sections are devoted to thermal effects, mechanical properties, principles of soldering and fluxes. Selection of proper solder for the job is explained, and fusible alloys described. Practical suggestions and description of company's solders are provided. Federated Metals Div., American Smelting and Refining Co.



"It ain't funny. Them wrenches cost dough!"

350 Power Brushes—Bulletin C-260, describing company's new power brushes, pictures their design. The Osborn Mfg. Co.

351 Tough and Flexible—Information is offered on Dynaprene cord, designed for durability and resistance to abrasion and cutting. Tells other advantages of this flexible, flame retardant cord. Whitney Blake Co.

352 Metallic Packing—This folder is devoted to company's elastic metallic packing intended for frictionless operation by means of an oil seal. Photos and text tell how seal is constructed, operates and is used. A. W. Chesterton Co.

353 Neoprene Goes to Work — Eight-pp Bulletin A-18 discusses the properties of Neoprene, showing how they are utilized in products made from this chemical rubber. Covers its toughness, hardness range, air retention, performance under load, at extreme temperatures, flame and chemical resistance. Rubber Chemicals Div., E. I. du Pont de Nemours & Co.

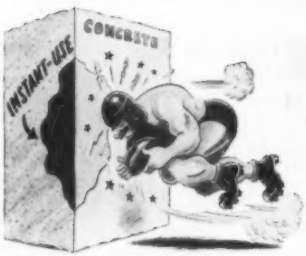
354 Progressive Mechanization in Action—Sixteen-pp Booklet GEA-5789 sets forth a program to help plant engineers step up the mechanization of operations for greater productivity, better products, lower unit cost. Discusses and illustrates this program through stages of hand operation, simple mechanization and improved mechanization to automatic control and continuous process stages, telling which operations would be benefited by the use of machines, greater power, higher speeds. General Electric Co.

355 Steam Condensers—Bulletin 102, 24 pp, is a comprehensive presentation of manufacturer's steam condensers and includes photos of six typical installations as well as a section of engineering data, a discussion of air removal equipment and condenser maintenance. Condenser Service & Engineering Co., Inc.

356 Where Refuse Is Fuel—Presented in 24-pp Bulletin 505 are installations of company's RotoStokers and RotoGrate stokers for use with medium size and larger units burning refuse fuels separately or in combination with coal. Lists many of the refuse fuels handled successfully by these spreader stokers. More than 20 installations shown. Detroit Stoker Co.

357 Tips on Plant Protection—Instructive information for engineers whose plants are engaged in defense production is furnished in this 16-pp manual. It is intended to solve plant protection problems by instituting security systems for preventing loss of life, damage to property. Training of personnel, planning of hourly routes, safety factors, fire prevention discussed. Detex Watchclock Corp.

REPAIR CONCRETE WITH INSTANT SETTING PATCH



TEST IT ON TRIAL OFFER

TOUGH AS NAILS! FAST!

Repair broken factory floors without the usual traffic tie-up. Simply shovel INSTANT-USE into the hole or rut — tamp smooth — truck over! No waiting! INSTANT-USE bonds tight to old concrete — right up to a feather edge. It's tough. Wears like iron. Won't crack or crumble. Install complete overlay where floors are badly chewed up. Used indoors or out. Immediate shipment.

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Please send me complete INSTANT-USE information, details of TRIAL ORDER PLAN and HAND BOOK OF BUILDING MAINTENANCE—no obligation. (Clip and attach Coupon to Co. letterhead.)

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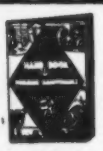

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Low Cost Protection for HEAT EXCHANGER TUBE ENDS

In the past 31 years Conseco has provided millions of Flowrites for tube inlets of heat exchangers operating in all industries and all applications. Tube inlets become eroded and worn long before the remainder of the tube, and by reinforcing the inlets it is possible to increase the effective tube life many times.

Flowrites—made of the same metal as the tubes—are available in any length, diameter or gauge. They are easy to install and remove by unskilled help. When Flowrites themselves become worn (*instead* of the tubes!), just pull them out and install new, longer Flowrites.

Get the facts from the 8-page Flowrite "proof" booklet, available upon request.

CONDENSER SERVICE & ENGINEERING CO.
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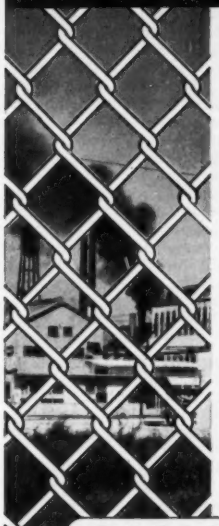

GIVES

Positive

PROTECTION

Positive protection for your grounds and property is assured with Realock Fence. In addition, all fittings, hinges and locking devices have bolts on the inside, secure from outside tampering.

Noted for its rugged construction and long-lasting weather resistance, Realock Fence can be depended upon for years of dependable, trouble-free service.

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WICKWIRE SPENCER STEEL DIVISION
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Simple! Easy! Best for Use With Pipe Machines, Power Drives or Bench Vises!

Threads ⅛ to 2" Pipe! Finger-tip Control! Nipples Easily Removed! No Wrenches Required!

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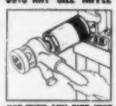
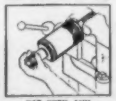
WITH POWER DRIVE—CUTS ANY SIZE NIPPLE



USE WITH ANY PIPE VISE



USE WITH ANY MACHINIST'S VISE

● The last word in simplicity! Only 3 parts—polished steel body, sliding plunger and a hardened steel threaded shank. Adapters for ⅛ up to 1½" pipe—no adapter needed for 2" pipe. Inserted pin holds sliding plunger in working position. All parts polished and rust-proofed. Packed in a compact, heavy-gauge sheet-metal kit box—can be bought without kit box if desired. Pays for itself by converting short pipe lengths into useful all-thread, close-thread or average nipples. Order today from your regular supply house. Immediate delivery!

BEAVER PIPE TOOLS
210-300 DANA AVE. • WARREN, OHIO

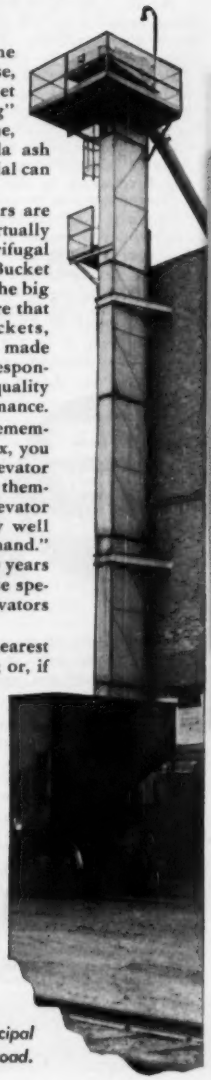
Give yourself a raise!

Saving money can be the same thing as giving yourself a raise, and with Rex® Standard Bucket Elevators the cost of "raising" coal, gravel, crushed limestone, foundry sand, wood chips, soda ash or any other free-flowing material can be substantially reduced.

Rex Standard Bucket Elevators are made in 3 basic designs to fit virtually every type of service . . . Centrifugal Discharge type, Continuous Bucket type and Super Capacity type. The big advantages you get with Rex are that all major components—buckets, chains, sprockets, housing—are made by Chain Belt Company. One responsibility . . . one high standard of quality . . . one sure measure of performance.

Another important point to remember is that when you specify Rex, you get the help of trained bucket elevator specialists . . . men who devote themselves exclusively to bucket elevator problems and are particularly well qualified to give you a "helping hand." They have behind them over 40 years of experience to help solve those special problems where standard elevators are not suitable.

For all the facts, call your nearest Rex Field Sales Engineer today; or, if you prefer, write to Chain Belt Company, 4777 W. Greenfield Ave., Milwaukee 1, Wis.



CHAIN BELT REX COMPANY

Chain Belt COMPANY OF MILWAUKEE

Sales Offices or Distributors in principal cities in the United States and abroad.

From Gas to Oil

(Continued from page 70)

cleans the system. As it can be left in the lines, this procedure materially reduces clean up labor costs usually required after each burn.

Air is supplied by a No. 1845 Sutorbilt rotary positive pressure blower driven through an Allis-Chalmers V-belt drive by a 125 hp 440 volt 3-phase induction motor. This equipment is installed centrally between No. 6 and No. 7 kilns. The blower intakes through a screened 18 in. pipe on top, and exhausts at the bottom into an 18 in. line.

An 18 in. by 18 in. by 6 in. tee has been installed in this air supply line with an electrically operated valve connected out to the atmosphere. This valve is phased with the motor to function automatically in case of power failure. Another 12 in. line is welded into the 18 in. supply line vertically and leads to a 12 in. adjustable shutter type relief valve which exhausts to the open air.

By exhausting to the atmosphere through this adjustable shutter, any desired air pressure from 1/4 lb to 3 lb can be obtained. This extreme flexibility of air supply in relation to fuel being used is an important requirement in this system. For example; when burning natural gas we use from 1 to 1-1/2 lb blower discharge pressure (depending on the number of kilns on the line), but have to increase pressure to 2-1/2 lb to operate on fuel oil.

An 18 in. by 16 in. by 14 in. Y distributes the air: the 16 in. line running to No's. 6, 5, 4, 3, 2, and 1 kilns; the 14 in. line supplying the No's. 7, 8, and 9 kilns. The air line is progressively reduced to a 10 in. diameter as it leads to the most distant kilns, and an 8 in. line, controlled by an 8 in. butterfly valve with positive stops, encircles each kiln. All air lines are 10-gauge steel, asphalt dipped, and with welded joints.

Electrical System

Most oil burning systems use steam to heat fuel at the burner, but we have installed electric heaters to eliminate the long steam lines that would be needed to supply our far-flung kilns.

The Quonset hut housing the blower also serves as an electrical sub-station. Three conduits, each feeding 3 kilns, run out to supply the 12 heaters in each kiln. As the main power is 440 volts, and the heaters are 220 volts, every other pair is connected in series. This way, it is possible to light every other fire hole for low temperature operations and then to cut in the remaining ones as required.

Thermostats on each heater maintain fuel oil temperatures at from 190 F to 205 F, but manual adjustment permits variation.

To eliminate moisture in these underground cables we circulate warm air, from the blower at the Quonset hut junction box, through the conduits to the conduit bodies adjacent to the heaters.

Burners

All of the No. 581 burners have two sets of fuel tubes; the standard

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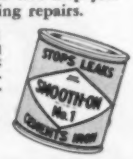

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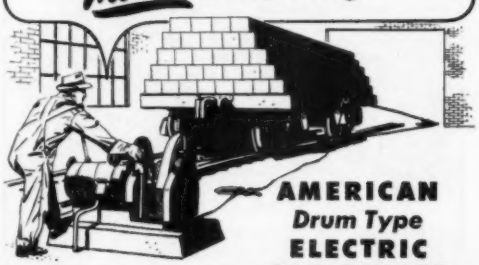

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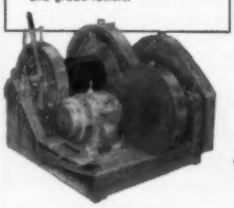

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fuel oil tube, and the additional gas burning tube which is threaded into separate oil injector bushings. To change from one fuel to the other it is necessary only to disconnect the supply hose and screw out the injector bushing with a special speed wrench. The replacement tube is started by hand and finished with the speed wrench.

Oil is supplied to each burner through a 2 ft long, 3/8 in. standard flexible metallic hose with slip-on couplings at both ends. Due to friction inside the metallic hose, the oil hose will not carry sufficient gas at our 5 lb pressure to reach top temperatures, so the gas supply hose is 3 ft long, 3/4 in. flame-resistant with standard water hose couplings.

All burners have been modified to meet the oxidizing conditions that must be adhered to during the firing period, and we allow as much excess air through them as possible during the entire burning range. The adjustable air sleeve stop has had a 3/16 in. spacer installed between the bracket and the burner body to allow further extension. The 3/8 in. slots in the cast iron inner air tube have been increased to 1/2 in. and the inside diameter has been bored to 1-5/8 in.

Except for storage tanks which we built ourselves, the cost of installing this stand-by system was only about $15,000 . . . a small price indeed for 25 per cent increase in production time which it has provided!

Bearings

(Continued from page 98)

If such bearings have outer races with equally deep shoulders pressure may be exerted in either direction, but where only one shoulder is deep the pressure must be applied against the deep shoulder. Bearings having no shoulder on the outer race, such as self-aligning bearings, must never be removed by applying pressure to the outer race.

Never attempt to remove a ball bearing by driving it with a punch or chisel, as this may seriously damage either the bearing or the shaft. If necessary, a split sleeve, having a steel block welded to each side, may be clamped on the shaft with wire, as shown in Fig. 7, and alternate blows applied to the welded blocks with a hammer and square end punch. The split sleeve will thus force the bearing inner race from the shaft.

If possible, bearings should be removed without damaging them, whether they are to be used again or not. This will permit them to be inspected for cause of failure, if defective, thus making it possible to determine whether a different type should be employed for replacement.

Removed bearings should be wrapped in clean paper or cloth for protection.

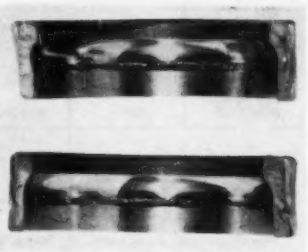

Photo: Marlin-Rockwell Corp.

Example of thrust bearing that was installed wrong way so load was imposed on bearing parts in wrong direction

Before mounting a bearing on a shaft, be sure to carefully clean the seating surfaces and apply a

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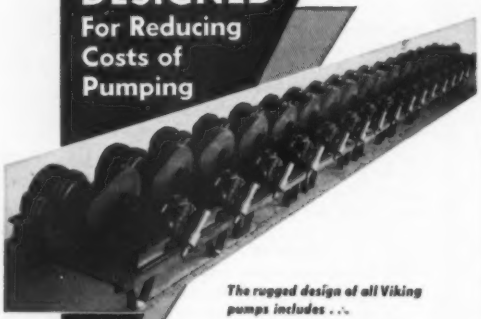

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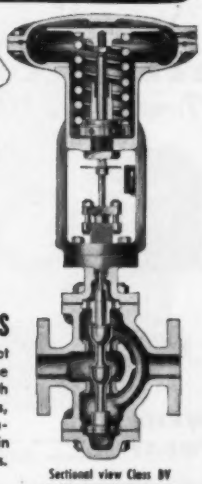

Sectional view Class BV Double Seated Diaphragm Control Valve

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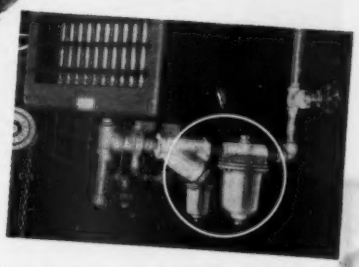

Check Your Unit Heater Steam Traps Now

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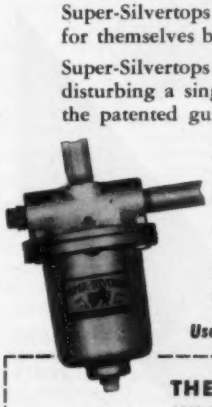
Super-Silvertops can be serviced without disturbing a single pipe fitting . . . and the patented guided bucket eliminates bucket damage common with other traps. The booklet "Solving Steam Trap Problems" contains complete data on selecting steam traps for unit heaters. Write for your copy today.



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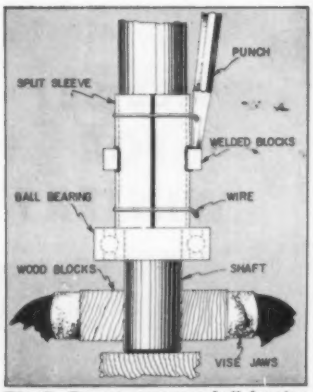


Fig. 7. Do not remove a ball bearing by driving it with punch or chisel. A split sleeve may be used successfully

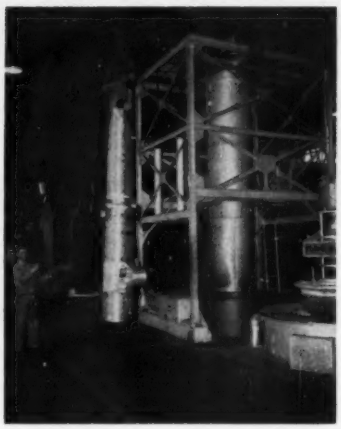
light coat of oil. See that the bearing is started straight before applying the full force of the press or other mounting means.

In mounting ball bearings, any of the methods explained for removing bearings may be employed, in reverse.

It is a good idea to cover ball bearings with a clean cloth, if possible, before attempting either to remove or mount them. This will help prevent dust and metal chips gaining entrance. Of course, the cloth must be cut away where pressure is applied to the bearing.

Always avoid using chipped tools or wood mallets when removing or mounting a ball bearing; never handle the bearing with dirty or moist hands; use clean cloths, never waste, to wipe a bearing; don't unwrap the bearing until ready to mount it; and don't wash the lubricant from a new bearing unless it is contaminated.

Special Equipment Handles Columns



Large columns used in manufacturing Aerol landing gears for Consolidated-Vultee B-36 bombers must be heat-treated at one stage of the processing at Cleveland Pneumatic Tool Co., Cleveland, O. Owing to the column's weight and length, Cleveland Pneumatic, in conjunction with Hevi-Duty, manufacturers of heat-treating furnaces, designed and fabricated the special tower equipment shown here. It is mounted on wheels that travel it over a series of furnaces. Electric hoisting equipment mounted midway in tower construction raises and lowers the cylinder suspended within the gantry crane structure. The cylinder is lowered over a column when it is ready to leave the high-temperature furnace and be transferred to the quenching tank. Under cylinder, excessive scaling of column is eliminated during transfer.

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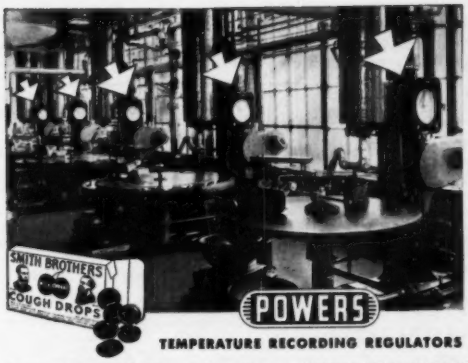

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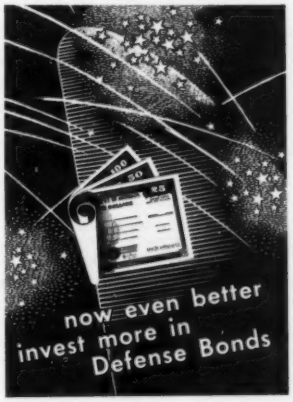

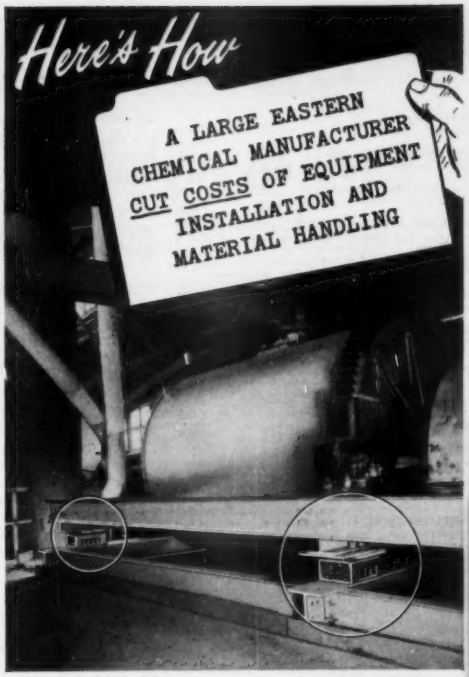

This Patterson Foundry & Machine Co., Pebble Mill, installed on an upper floor in a large eastern chemical plant, is mounted on eight Korfund Steel Spring Vibro-Isolators. Total sprung weight is approximately 42 tons.

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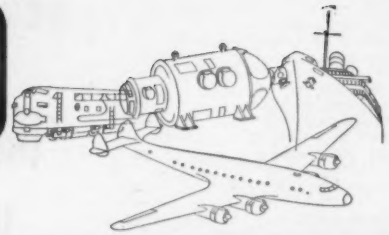

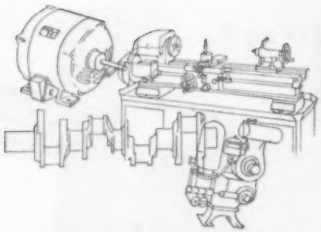

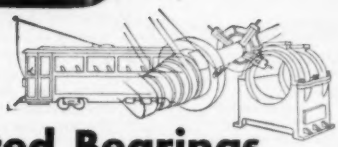

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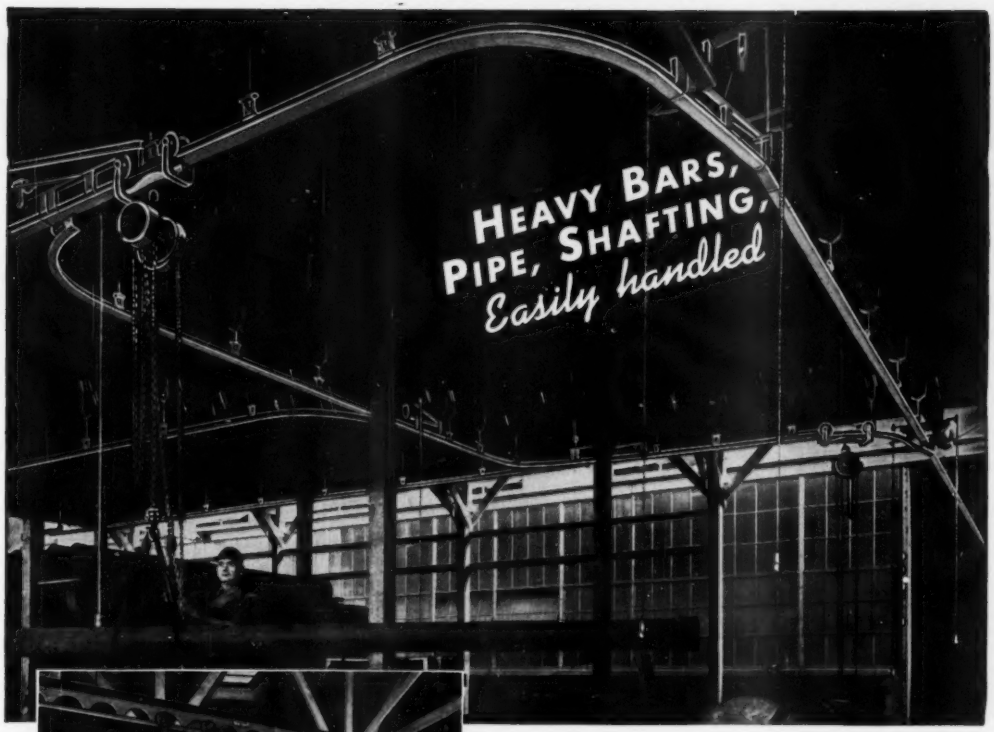

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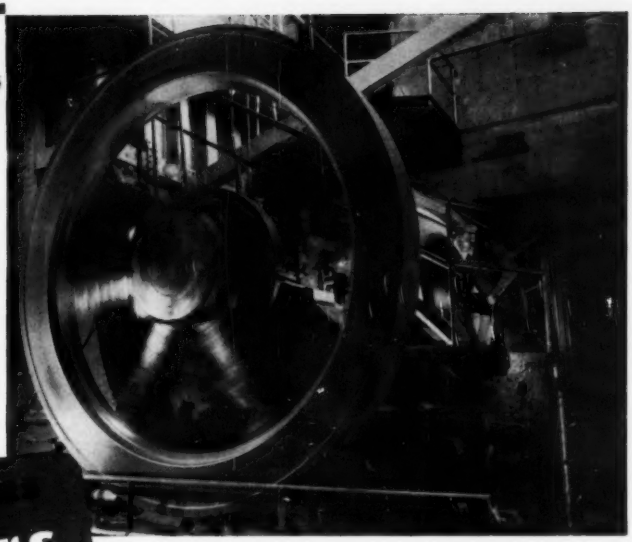
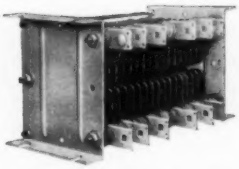


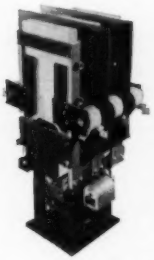
IT TAKES CONTROLLED POWER to process copper ore. Crushing run-of-the-mine ore in this giant jaw crusher, for example, takes a 300-horsepower wound-rotor motor and an Allis-Chalmers Type H Starter engineered especially for extremely high starting inertia and variable loads.

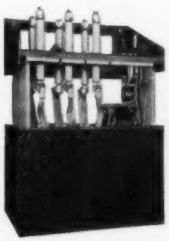
A-3670

THIS STARTER controls the motor to provide smooth acceleration in overcoming the inertia of heavy crusher jaws and large fly wheels. This is accomplished by means of a full automatic starter having six secondary accelerating steps.



EXTRA HEAVY DUTY resistors in the motor secondary circuit provide starting torque and smooth acceleration. Adjustable time delay relays control closing of the accelerating contactors to cut out successive resistor banks . . . automatically bringing the crusher to speed.





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